Appendix F /\* IR after various phases for first part of program\*/ IR after CIL Reader (flag cil) #37 = START try  $\underline{i}$ ,  $\underline{q}$ ,  $\underline{a}$ ,  $\underline{b}$  = ENTERFUNC \_try #37 #40 = ASSIGN 0 #41 = ASSIGN \_q t110 #41 = ASSIGN  $\overline{0}$ [t110] #42 GOTO \$L2 #42 \$L2: (2 refs) #42 = ASSIGN \_q = CMP(EQ) [t111], 0 t111 #42 t112 #42 CBRANCH(EQ) t112, \$L4, \$L3 #42 \$L4: (1 ref) #42 = CMP(NE) j, 8 t113 #42 CBRANCH(NE) t113, \$L5, \$L3 #42 \$L5: (1 ref) #44 = ADD j, 1 t114 #44 =  $ASSI\overline{G}N t114$ \_j t115 #45 = ASSIGN q #45 = ASSIGN  $\overline{0}$ [t115] #46 = MUL \_j, 4 = ADD \_b, t116 t116 #46 t117 #46 = ASSIGN t117 t118 #46 = CMP(EQ) [t118], 1t119 #46 CBRANCH(EQ) t119, \$L7, \$L6 #46 \$L7: (1 ref) = ADD \_i, \_j #46 t120 #46 = MUL t120, 4t121 #46 = ADD a, t121 t122 #46 = ASSIGN t122 t123 #46 = CMP(EQ) [t123], 1t124 #46 CBRANCH(EQ) t124, \$L8, \$L6 #46 \$L8: (1 ref) #46 = SUB \_i, \_j = ADD t126, 7 t126 #46 t127 #46 = MUL t127, 4 t128 #46 = SUBSCRIPT & c, t128 t129 #46 = ASSIGN t129 t130 #46 = CMP(EQ) [t130], 1t131 #46 CBRANCH(EQ) t131, \$L9, \$L6 #46 \$L9: (1 ref) #48 t133 = MUL i, 4 #48 = SUBSCRIPT & x, t133 t134 #48 = ASSIGN t134 t135

Page 1

#48

#49

#49

#49

#49

#50

= ASSIGN \_j

= MUL  $_{j}$ , 4

= ADD  $\overline{}$  b, t136

= ASSIGN t137

= ASSIGN 0

= ADD \_i, \_j

[t135]

t136

t137

t138

[t138]

t139

```
#50
  t.140
               = MUL t139, 4
                                                                           #50
              = ADD a, t140
  t141
                                                                           #50
              = ASSIGN t141
                                                                           #50
              = ASSIGN 0
  [t142]
                                                                           #51
              = SUB _i, _j
  t143
                                                                           #51
              = ADD \overline{t}143, 7
  t144
                                                                           #51
              = MUL t144, 4
  t145
                                                                           #51
              = SUBSCRIPT & c, t145
  t146
                                                                           #51
              = ASSIGN t146
  t147
                                                                           #51
               = ASSIGN 0
   [t147]
                                                                           #52
               = CMP(LT) i, 8
   t148
                 CBRANCH(LT) t148, $L11, $L10
                                                                           #52
                                                                           #52
$L11: (1 ref)
               = ADD _i, 1
                                                                           #54
   t149
               = CALL _try, t149, _q, _a, _b, {-5} [Handler: $L1]
                                                                           #54
   {-5}
                                                                           #55
               = ASSIGN q
   t151
                                                                           #55
   t152
               = CMP(EO) [t151], 0
                                                                           #55
                 CBRANCH(EQ) t152, $L13, $L12
                                                                           #55
$L13: (1 ref)
                                                                           #57
               = MUL _j, 4
= ADD _b, t153
   t153
                                                                           #57
   t154
                                                                           #57
               = ASSIGN t154
   t155
                                                                           #57
               = ASSIGN 1
   [t155]
                                                                           #58
   t156
               = ADD _i, _j
                                                                           #58
               = MUL t156, 4
   t157
                                                                           #58
              = ADD a, t157
   t158
                                                                           #58
              = ASSIGN t158
   t159
                                                                           #58
              = ASSIGN 1
   [t159]
                                                                           #59
               = SUB _i, _j
   t160
                                                                           #59
              = ADD \overline{t}160, 7
   t161
                                                                           #59
              = MUL t161, 4
   t162
              = SUBSCRIPT &_c, t162
                                                                           #59
   t163
                                                                           #59
               = ASSIGN t163
   t164
                                                                           #59
               = ASSIGN 1
   [t164]
                                                                           #55
                 GOTO $L12
                                                                           #55
$L12: (2 refs)
                                                                           #62
                 GOTO $L14
                                                                           #52
$L10: (1 ref)
                                                                           #62
   t165
               = ASSIGN q
                                                                           #62
               = ASSIGN 1
   [t165]
                                                                           #62
                 GOTO $L14
                                                                           #62
$L14: (2 refs)
                                                                           #46
                 GOTO $L6
                                                                           #46
$L6: (4 refs)
                                                                           #64
                 GOTO $L2
                                                                            #42
      (2 refs)
$L3:
                                                                            #65
                 GOTO $L15
                                                                            #37
$L1: (1 ref)
                                                                            #37
                 UNWIND try
                                                                            #65
$L15: (1 ref)
                                                                            #65
                 EXITFUNC try
                                                                            #65
                  END try, \{-7\}
```

IR after Type Checker (flag Type Checker)

```
#37
              = START try
   _i, _q, _a, _b = ENTERFUNC _try
_j = ASSIGN 0
t110 = ASSIGN _q
[t110] - ASSIGN _q
                                                                              #37
                                                                              #40
                                                                              #41
                                                                              #41
   [t110]
              = ASSIGN \overline{0}
                                                                              #42
                 GOTO $L2
                                                                              #42
$L2: (2 refs)
                                                                              #42
   t111
               = ASSIGN _q
                                                                              #42
                = CMP(EQ) [t111], 0
   t112
                                                                              #42
                CBRANCH(EQ) t112, $L4, $L3
                                                                              #42
$L4: (1 ref)
                                                                              #42
               = CMP(NE) _{j}, 8
   t113
                                                                              #42
                CBRANCH (\overline{NE}) t113, $L5, $L3
                                                                              #42
$L5: (1 ref)
                                                                              #44
   t114
               = ADD _j, 1
                                                                              #44
   _j
               = ASSIGN t114
                                                                              #45
   <del>t</del>115
              = ASSIGN q
                                                                              #45
              = ASSIGN \overline{0}
   [t115]
                                                                              #46
              = MUL _{\rm j}, 4
   t116
              = ADD b, t116
                                                                              #46
   t117
              = ASSIGN t117
                                                                              #46
   t118
                                                                              #46
              = CMP(EQ) [t118], 1
   t119
                                                                              #46
                 CBRANCH(EQ) t119, $L7, $L6
                                                                              #46
$L7: (1 ref)
                                                                              #46
         = ADD _i, _j
= MUL t120, 4
   t120
                                                                              #46
   t121
                                                                              #46
               = ADD a, t121
   t122
                                                                              #46
               = ASSIGN t122
   t123
                                                                              #46
               = CMP(EQ) [t123], 1
   t124
                                                                              #46
                  CBRANCH(EQ) t124, $L8, $L6
                                                                              #46
$L8: (1 ref)
                                                                               #46
   t126 = SUB _i, _j

t127 = ADD t126, 7
                                                                               #46
                                                                               #46
               = MUL t127, 4
   t128
               = SUBSCRIPT & c, t128
                                                                               #46
   t129
                                                                               #46
               = ASSIGN t129
   t130
                                                                               #46
               = CMP(EQ) [t130], 1
   t131
                                                                               #46
                 CBRANCH(EQ) t131, $L9, $L6
                                                                               #46
$L9: (1 ref)
                                                                               #48
                = MUL i, 4
   t133
                                                                               #48
   t134
               = SUBSCRIPT & x, t133
                                                                               #48
               = ASSIGN t134
                                                                               #48
               = ASSIGN _j
   [t135]
               = MUL _j, \frac{1}{4}
= ADD _b, t136
                                                                               #49
   t136
                                                                               #49
   t137
                                                                               #49
               = ASSIGN t137
   t138
                                                                               #49
               = ASSIGN 0
    [t138]
              = ADD _i, _j
= MUL t139, 4
                                                                               #50
   t139
                                                                               #50
   t140
                                                                               #50
   t141
               = ADD _a, t140
```

```
#50
  t.142
               = ASSIGN t141
                                                                               #50
               = ASSIGN 0
   [t142]
                                                                               #51
               = SUB i, _j
                                                                               #51
               = ADD \overline{t}143, 7
  t144
                                                                               #51
               = MUL t144, 4
   t145
                                                                               #51
               = SUBSCRIPT & c, t145
  t146
                                                                               #51
               = ASSIGN t146
                                                                               #51
               = ASSIGN 0
   [t147]
                                                                               #52
                = CMP(LT) i, 8
   t148
                                                                               #52
                  CBRANCH(LT) t148, $L11, $L10
                                                                               #52
$L11: (1 ref)
                                                                               #54
   t149
                = ADD _i, 1
                = CALL try, t149, _q, _a, _b, {-5} [Handler: $L1]
                                                                               #54
   {-5}
                = ASSIG\overline{N} _q
                                                                               #55
   t151
                                                                               #55
                = CMP(EQ) [t151], 0
   t152
                                                                               #55
                  CBRANCH (EQ) t152, $L13, $L12
                                                                               #55
$L13: (1 ref)
                                                                               #57
                = MUL _j, 4
= ADD _b, t153
   t153
                                                                               #57
   t154
                                                                               #57
   t155
               = ASSIGN t154
                                                                               #57
               = ASSIGN 1
   [t155]
               = ADD _i, _j
                                                                               #58
   t156
                                                                               #58
               = MUL \pm 156, 4
   t157
                                                                               #58
               = ADD a, t157
   t158
                                                                               #58
   t159
               = ASSIGN t158
                                                                               #58
               = ASSIGN 1
   [t159]
                                                                               #59
               = SUB _i, _j
= ADD t160, 7
   t160
                                                                               #59
   t161
               = MUL t161, 4
                                                                               #59
   t162
               = SUBSCRIPT & c, t162
                                                                               #59
   t163
                                                                               #59
               = ASSIGN t163
   t164
                                                                               #59
                = ASSIGN 1
   [t164]
                                                                               #55
                  GOTO $L12
                                                                               #55
$L12: (2 refs)
                                                                               #62
                  GOTO $L14
                                                                               #52
$L10: (1 ref)
                                                                               #62
   t165
                = ASSIGN q
                = ASSIGN \overline{1}
                                                                               #62
   [t165]
                                                                               #62
                  GOTO $L14
                                                                               #62
$L14: (2 refs)
                                                                               #46
                  GOTO $L6
                                                                               #46
$L6:
      (4 refs)
                                                                               #64
                  GOTO $L2
                                                                               #42
$L3:
     (2 refs)
                                                                               #65
                  GOTO $L15
                                                                               #37
$L1:
      (1 ref)
                                                                               #37
                  UNWIND _try
                                                                               #65
$L15: (1 ref)
                                                                               #65
                  EXITFUNC try
                                                                                #65
                  END try, \{-7\}
```

```
{-7} = START _try
_i, _q, _a, _b = ENTERFUNC _try
                                                                               #37
                                                                               #37
                                                                               #40
               = ASSIGN 0
                                                                               #41
   t110
               = ASSIGN q
                                                                               #41
                = ASSIGN 0
   [t110]
                                                                               #42
                  GOTO $L2
                                                                               #42
$L2: (2 refs)
                = ASSIGN _q
                                                                               #42
   t111
                                                                               #42
                = CMP(EQ)^{-}[t111], 0
   t112
                                                                               #42
                 CBRANCH(EQ) t112, $L4, $L3
                                                                               #42
$L4: (1 ref)
                                                                               #42
                = CMP(NE) j, 8
  t113
                                                                               #42
                 CBRANCH(\overline{\text{NE}}) t113, $L5, $L3
                                                                               #42
$L5: (1 ref)
                                                                               #44
   t114
                = ADD j, 1
                                                                               #44
                = ASSIGN t114
   _j
t115
                                                                               #45
                = ASSIGN q
                                                                               #45
               = ASSIGN \overline{0}
   [t115]
                                                                               #46
               = MUL _{j}, 4
   t116
                                                                               #46
               = ADD \overline{} b, t116
   t117
                                                                               #46
                = ASSIGN t117
   t118
                                                                               #46
                = CMP(EQ) [t118], 1
   t119
                                                                               #46
                  CBRANCH(EQ) t119, $L7, $L6
                                                                                #46
$L7: (1 ref)
                                                                                #46
                = ADD _i, _j
   t120
                                                                                #46
                = MUL \overline{t}120, 4
   t121
                                                                                #46
                = ADD a, t121
   t122
                                                                                #46
                = ASSIGN t122
   t123
                                                                                #46
   t124
                = CMP(EO) [t123], 1
                                                                                #46
                  CBRANCH(EQ) t124, $L8, $L6
                                                                                #46
$L8: (1 ref)
                                                                                #46
                = SUB _i, _j
   t126
                                                                                #46
                = ADD \ \overline{t}126, 7
   t127
                                                                                #46
                = MUL t127, 4
   t128
                                                                                #46
                = ADD & c, t128
   t129
                                                                                #46
                = ASSIGN t129
   t130
                                                                                #46
                = CMP(EQ) [t130], 1
   t131
                                                                                #46
                 CBRANCH(EQ) t131, $L9, $L6
                                                                                #46
$L9: (1 ref)
                                                                                #48
                = MUL i, 4
   t133
                                                                                #48
                = ADD \overline{\&} x, t133
   t134
                                                                                #48
                = ASSIGN t134
   t135
               = ASSIGN _j
                                                                                #48
   [t135]
                = MUL _j, 4
= ADD b, t136
                                                                                #49
   t136
                                                                                #49
   t137
                                                                                #49
                = ASSIGN t137
   t138
                                                                                #49
               = ASSIGN 0
   [t138]
                                                                                #50
               = ADD _i, _j
   t139
                                                                                #50
               = MUL \overline{t}139, 4
   t140
                                                                                #50
               = ADD _a, t140
   t141
                                                                                #50
               = ASSIGN t141
   t142
   [t142] = ASSIGN 0
                                                                                #50
```

```
AppendixF.txt
```

```
= SUB _i, _j
                                                                              #51
  t143
                                                                              #51
               = ADD t143, 7
  t144
                                                                              #51
  t145
               = MUL t144, 4
                                                                              #51
               = ADD & c, t145
  t146
                                                                              #51
               = ASSIGN t146
  t147
                                                                              #51
   [t147]
               = ASSIGN 0
                                                                              #52
                = CMP(LT) i, 8
   t148
                                                                              #52
                  CBRANCH(LT) t148, $L11, $L10
                                                                              #52
$L11: (1 ref)
                                                                              #54
   t149
                = ADD _i, 1
               = CALL _try, t149, _q, _a, _b, {-5} [Handler: $L1]
                                                                              #54
   \{-5\}
                = ASSIGN _q
                                                                              #55
   t151
                = CMP(EQ)^{-}[t151], 0
                                                                              #55
   t152
                                                                              #55
                  CBRANCH(EQ) t152, $L13, $L12
                                                                              #55
$L13: (1 ref)
                                                                              #57
   t153
                = MUL j, 4
                                                                              #57
                = ADD ^-b, t153
   t154
                = ASSI\overline{G}N t154
                                                                              #57
   t155
                                                                              #57
   [t155]
                = ASSIGN 1
               = ADD i, _j
                                                                              #58
   t156
                                                                              #58
               = MUL \overline{t}156, 4
   t157
                                                                              #58
               = ADD a, t157
   t158
                                                                              #58
                = ASSIGN t158
   t159
                                                                              #58
               = ASSIGN 1
   [t159]
               = SUB _i, _j
                                                                              #59
   t160
                                                                              #59
                = ADD \overline{t}160, 7
   t161
                                                                              #59
                = MUL t161, 4
   t162
                                                                              #59
                = ADD & c, t162
   t163
                                                                              #59
                = ASSIGN t163
   t164
                                                                              #59
                = ASSIGN 1
   [t164]
                                                                              #55
                  GOTO $L12
                                                                              #55
$L12: (2 refs)
                                                                              #62
                  GOTO $L14
                                                                              #52
$L10: (1 ref)
                                                                              #62
   t165
                = ASSIGN q
                                                                              #62
                = ASSIGN 1
   [t165]
                                                                              #62
                  GOTO $L14
                                                                              #62
$L14: (2 refs)
                                                                              #46
                  GOTO $L6
                                                                              #46
$L6: (4 refs)
                                                                              #64
                  GOTO $L2
                                                                              #42
$L3: (2 refs)
                                                                              #65
                  GOTO $L15
                                                                              #37
$L1: (1 ref)
                                                                              #37
                  UNWIND _try
                                                                              #65
$L15: (1 ref)
                                                                              #65
                  EXITFUNC _try
                                                                              #65
                  END try, \{-7\}
```

IR after Ssa Construction and Optimization (flag Ssa)

==== Block 1 Pred() Succ(2) next 2 pre 1 post 38 iDom 1 df Page 6

```
#37
    \{-7\}, \{-1\} = START try
==== Block 2 Pred(1) Succ(3) prev 1 next 3 pre 2 post 37 iDom 1 df
   i<*4>, q<*3>, a<*2>, b<*1> = ENTERFUNC try
                                                                                             #37
                                                                                             #40
                  = ASSIGN 0
     j<*5>
   tv110 - <*8> = ASSIGN q<3>
                                                                                             #41
                                                                                             #41
    [tv110-<8>] = ASSIGN \overline{0}
                                                                                             #42
                      GOTO $L2
==== Block 3 Pred(15,2) Succ(16,4) prev 2 next 4 pre 3 post 36 iDom 2 df 3
$L2: (2 refs)
    j<*6>
                   = PHI _j < 7 > , _j < 5 >
                                                                                             #65
                                                                                             #42
   tv111-<*9> = ASSIGN q<3>
    tv112 - \langle *10 \rangle = CMP(EQ) [tv111 - \langle 9 \rangle], 0
                                                                                             #42
                      CBRANCH(EQ) tv112-<10>, $L4, $L3
                                                                                             #42
==== Block 4 Pred(3) Succ(16,5) prev 3 next 5 pre 10 post 35 iDom 3 df 3,16,
19
                                                                                             #42
$L4: (1 ref)
    tv113 - \langle *11 \rangle = CMP(NE) j<6>, 8
                                                                                             #42
                                                                                             #42
                      CBRANCH(NE) tv113-<11>, $L5, $L3
==== Block 5 Pred(4) Succ(15,6) prev 4 next 6 pre 11 post 34 iDom 4 df 3,19
                                                                                             #42
$L5: (1 ref)
                                                                                             #44
    tv114 - <*12> = ADD j <6>, 1
                                                                                             #44
     j<*7>
               = ASSIGN tv114-<12>
                                                                                             #45
    tv115 - (*13) = ASSIGN q < 3
                                                                                             #45
    [tv115-<13>] = ASSIGN 0
    tv116 - < *14 > = MUL j < 7 > , 4
                                                                                             #46
                                                                                             #46
    tv117 - \langle *15 \rangle = ADD \quad b \langle 1 \rangle, \quad tv116 - \langle 14 \rangle
    tv119 - \langle *16 \rangle = CMP(EQ) [tv117 - \langle 15 \rangle], 1
                                                                                             #46
                      CBRANCH(EQ) tv119-<16>, $L7, $L6
==== Block 6 Pred(5) Succ(15,7) prev 5 next 7 pre 14 post 33 iDom 5 df 15,19
                                                                                             #46
$L7: (1 ref)
    tv120 - <*17> = ADD i<4>, j<7>
                                                                                             #46
    tv121 - \langle *18 \rangle = MUL \ tv120 - \langle \overline{17} \rangle, 4
                                                                                             #46
                                                                                             #46
    tv122 - \langle *19 \rangle = ADD \quad a \langle 2 \rangle, \quad tv121 - \langle 18 \rangle
    tv124 - \langle *20 \rangle = CMP(EQ) [tv122 - \langle 19 \rangle], 1
                                                                                             #46
                      CBRANCH(EQ) tv124-<20>, $L8, $L6
                                                                                             #46
==== Block 7 Pred(6) Succ(15,8) prev 6 next 8 pre 15 post 32 iDom 6 df 15,19
$L8: (1 ref)
                                                                                             #46
    tv126-<*21> = SUB i<4>, _j<7>
                                                                                             #46
    tv127 - \langle *22 \rangle = ADD \ tv126 - \langle 21 \rangle, 7
                                                                                             #46
    tv128 - \langle *23 \rangle = MUL \ tv127 - \langle 22 \rangle, 4
    tv129 - < *24 > = ADD & c, tv128 - < 23 >
                                                                                             #46
                                                                                             #46
    tv131-<*25> = CMP(EQ) [tv129-<24>], 1
                      CBRANCH(EQ) tv131-<25>, $L9, $L6
                                                                                             #46
==== Block 8 Pred(7) Succ(13,9) prev 7 next 9 pre 16 post 31 iDom 7 df 15,19
                                                                                             #46
$L9: (1 ref)
                                                                                             #48
    tv133 - <*26> = MUL i < 4>, 4
                                                                                             #48
    tv134 - \langle *27 \rangle = ADD \& x, tv133 - \langle 26 \rangle
    [tv134-<27>] = ASSIGN _j<7>
                                                                                             #48
                                                                                             #49
    tv136-<*28> = MUL _j<7>, 4
                                                                                             #49
    tv137 - \langle *29 \rangle = ADD \quad b \langle 1 \rangle, \quad tv136 - \langle 28 \rangle
    [tv137-<29>] = ASSIGN 0
                                                                                             #49
    tv139 - <*30> = ADD i < 4>, j < 7>
                                                                                             #50
    tv140 - \langle *31 \rangle = MUL \ tv139 - \langle 30 \rangle, 4
                                                                                             #50
```

AppendixF.txt #50  $tv141 - \langle *32 \rangle = ADD \quad a < 2 \rangle, \quad tv140 - \langle 31 \rangle$ #50 [tv141-<32>] = ASSIGN 0#51 tv143 - <\*33> = SUB i <4>, #51  $tv144 - \langle *34 \rangle = ADD \ \overline{t}v143 - \langle \overline{3}3 \rangle$ , 7 #51  $tv145 - \langle *35 \rangle = MUL \ tv144 - \langle 34 \rangle$ , 4 #51 tv146 - <\*36> = ADD & c, tv145 - <35>#51  $[tv146-<36>] = ASSI\overline{G}N 0$ #52 tv148 - <\*37> = CMP(LT) i<4>, 8 CBRANCH( $\bar{L}T$ ) tv148-<37>, \$L11, \$L10 #52 ==== Block 9 Pred(8) Succ(10,17) prev 8 next 17 pre 21 post 30 iDom 8 df 14, 19 #52 \$L11: (1 ref) #54 tv149 - <\*38> = ADD i<4>, 1= CALL try, tv149-<38>, q<3>, a<2>, b<1>,  $\{-5\}$  [Handler: \$L1] #54 #65 GOTO \$L16 ==== Block 17 Pred(9) Succ(19) prev 9 next 10 pre 28 post 29 iDom 9 df 19 #37 \$L1: (1 ref) UNWIND try ==== Block 10 Pred(9) Succ(12,11) prev 17 next 11 pre 22 post 27 iDom 9 df 1 #65 \$L16: (1 ref) #55 tv151 - < \*39 > = ASSIGN q < 3 >#55  $tv152 - \langle *40 \rangle = CMP(EQ) [tv151 - \langle 39 \rangle], 0$ #55 CBRANCH(EQ) tv152-<40>, \$L13, \$L12 ==== Block 11 Pred(10) Succ(12) prev 10 next 12 pre 25 post 26 iDom 10 df 12 #55 \$L13: (1 ref) #57 tv153 - <\*41> = MUL j<7>, 4#57 tv154 - <\*42> = ADD b<1>, tv153 - <41>#57 [tv154-<42>] = ASSIGN 1#58 tv156 - < \*43 > = ADD i < 4 > , j < 7 >#58  $tv157 - \langle *44 \rangle = MUL \ tv156 - \langle \overline{4}3 \rangle$ , 4 #58 tv158 - < \*45 > = ADD a < 2 > , tv157 - < 44 >#58 [tv158 - < 45>] = ASSIGN 1#59  $tv160 - <*46> = SUB _i <4>, _j <7>$ #59  $tv161 - \langle *47 \rangle = ADD \ tv160 - \langle \overline{4}6 \rangle$ , 7 #59 tv162 - <\*48> = MUL tv161 - <47>, 4#59  $tv163 - \langle *49 \rangle = ADD \& c, tv162 - \langle 48 \rangle$ #59 [tv163-<49>] = ASSIGN 1#55 GOTO \$L12 ==== Block 12 Pred(11,10) Succ(14) prev 11 next 13 pre 23 post 24 iDom 10 df 14 #55 \$L12: (2 refs) #62 GOTO \$L14 ==== Block 13 Pred(8) Succ(14) prev 12 next 14 pre 17 post 20 iDom 8 df 14 #52 \$L10: (1 ref) #62 tv165 - <\*50> = ASSIGN q<3>#62 [tv165-<50>] = ASSIGN 1#62 GOTO \$L14 ==== Block 14 Pred(13,12) Succ(15) prev 13 next 15 pre 18 post 19 iDom 8 df #62 \$L14: (2 refs)

```
#46
                  GOTO $L6
==== Block 15 Pred(14,7,6,5) Succ(3) prev 14 next 16 pre 12 post 13 iDom 5 d
f 3
$L6: (4 refs)
                                                                             #64
                  GOTO $L2
==== Block 16 Pred(4,3) Succ(18) prev 15 next 18 pre 4 post 9 iDom 3 df 19
$L3: (2 refs)
                                                                             #65
                  GOTO $L15
==== Block 18 Pred(16) Succ(19) prev 16 next 19 pre 5 post 8 iDom 16 df 19
                                                                             #65
$L15: (1 ref)
                  EXITFUNC try
                                                                             #65
==== Block 19 Pred(18,17) Succ() prev 18 pre 6 post 7 iDom 3 df
                                                                             #65
                  END try, \{-7\}
IR after Ssa Info Destruction (flag Ssa)
               = START try
                                                                             #37
   i<*4>, q<*3>, a<*2>, b<*1> = ENTERFUNC _try
                                                                             #37
   _j<*5>
               = ASSIGN 0
                                                                             #40
   t110
               = ASSIGN q
                                                                             #41
                                                                             #41
   [t110]
               = ASSIGN 0
                                                                             #42
                  GOTO $L2
$L2: (2 refs)
                                                                             #42
   t111
               = ASSIGN q
                                                                             #42
                                                                             #42
   t112
               = CMP(EQ) [t111], 0
                  CBRANCH(EQ) t112, $L4, $L3
                                                                             #42
$L4: (1 ref)
                                                                             #42
                = CMP(NE) _{j}, 8
   t113
                                                                             #42
                  CBRANCH (\overline{NE}) t113, $L5, $L3
                                                                             #42
                                                                             #42
$L5: (1 ref)
                                                                             #44
   t114
               = ADD j, 1
                                                                             #44
               = ASSIGN t114
   j<*7>
               = ASSIGN q
                                                                             #45
   t.115
               = ASSIGN \overline{0}
                                                                             #45
   [t115]
                                                                             #46
   t116
               = MUL j, 4
   t117
               = ADD \overline{} b, t116
                                                                             #46
               = CMP(\overline{EQ}) [t117], 1
                                                                             #46
   t119
                                                                             #46
                  CBRANCH(EQ) t119, $L7, $L6
                                                                             #46
$L7: (1 ref)
               = ADD _i, _j
                                                                             #46
   t120
               = MUL \overline{t}120, 4
                                                                             #46
   t121
                                                                             #46
   t122
                = ADD _a, t121
   t124
               = CMP(EQ) [t122], 1
                                                                             #46
                  CBRANCH(EQ) t124, $L8, $L6
                                                                             #46
$L8: (1 ref)
                                                                             #46
               = SUB _i, _j
                                                                             #46
   t126
               = ADD t126, 7
                                                                             #46
   t127
                                                                             #46
   t128
               = MUL t127, 4
               = ADD & c, t128
                                                                             #46
   t129
                = CMP(EQ) [t129], 1
                                                                             #46
   t131
                                                                             #46
                  CBRANCH(EQ) t131, $L9, $L6
$L9: (1 ref)
                                                                             #46
```

```
#48
               = MUL i, 4
  t133
                                                                               #48
               = ADD & x, t133
  t134
                                                                               #48
               = ASSIGN _j
   [t134]
               = MUL _{j}, _{4}
= ADD _{b}, t136
                                                                               #49
  t136
                                                                               #49
  t137
                                                                               #49
               = ASSIGN 0
   [t137]
                                                                               #50
               = ADD _{i}, _{j}
= MUL _{t139}, 4
  t139
                                                                               #50
   t140
                                                                               #50
               = ADD a, t140
   t141
                                                                               #50
               = ASSIGN 0
   [t141]
               = SUB _i, _j
                                                                               #51
   t143
                                                                               #51
               = ADD \overline{t}143, 7
   t144
                                                                               #51
               = MUL t144, 4
   t145
                                                                               #51
   t146
               = ADD \& c, t145
                                                                               #51
               = ASSIGN 0
   [t146]
                                                                               #52
                = CMP(LT) i, 8
   t148
                                                                               #52
                  CBRANCH(LT) t148, $L11, $L10
                                                                               #52
$L11: (1 ref)
                                                                               #54
   t149
                = ADD _i, 1
                                                                               #54
                = CALL try, t149, q, a, b, {-5} [Handler: $L1]
   \{-5\}
                                                                               #65
                  GOTO $L16
                                                                               #65
$L16: (1 ref)
                                                                               #55
                = ASSIGN q
= CMP(EQ) [t151], 0
   t151
                                                                               #55
   t152
                                                                               #55
                  CBRANCH(EQ) t152, $L13, $L12
                                                                               #55
$L13: (1 ref)
                                                                               #57
                = MUL _j, 4
= ADD _b, t153
   t153
                                                                               #57
   t154
                                                                               #57
               = ASSIGN 1
   [t154]
                                                                               #58
                = ADD _i, _j
   t156
                                                                               #58
                = MUL \pm 156, 4
   t157
                                                                               #58
                = ADD a, t157
   t158
                                                                                #58
               = ASSIGN 1
   [t158]
                                                                                #59
               = SUB _i, _j
   t160
                                                                                #59
               = ADD \ \overline{t}160, 7
   t161
                                                                                #59
               = MUL t161, 4
   t162
                                                                                #59
               = ADD \& c, t162
   t163
                                                                                #59
   [t163]
                = ASSIGN 1
                                                                                #55
                   GOTO $L12
                                                                                #55
$L12: (2 refs)
                                                                                #62
                   GOTO $L14
                                                                                #52
$L10: (1 ref)
                                                                                #62
   t165
                = ASSIGN q
                                                                                #62
                = ASSIGN 1
   [t165]
                                                                                #62
                   GOTO $L14
                                                                                #62
$L14: (2 refs)
                                                                                #46
                   GOTO $L6
                                                                                #46
$L6: (4 refs)
                                                                                #64
                   GOTO $L2
                                                                                #42
$L3: (2 refs)
                                                                                #65
                   GOTO $L15
                                                                                #37
$L1:
      (1 ref)
                                                                                #37
                   UNWIND try
```

```
#65
$L15: (1 ref)
                  EXITFUNC try
                                                                              #65
                                                                               #65
                  END try, \{-7\}
IR after Lower (flag Lower)
   \{-7\}
                                                                              #37
               = START try
   i < *4 >, q < *3 >, a < *2 >, b < *1 > = ENTERFUNC _try
                                                                              #37
                                                                              #37
                  PROLOGEND
                                                                               #40
   j[FP]
                = mov 0
              = mov _q[_FP]
                                                                               #41
   t110 ( rd)
   [t110(rd)] = mov \overline{0}
                                                                               #41
                                                                               #42
                  jmp $L2
                                                                               #42
$L2: (2 refs)
                                                                               #42
              = mov q[FP]
   t111( rd)
   t112(EFLAGS) = cmp(EQ) [t111(rd)], 0
                                                                               #42
                  jcc(EQ) t112(EFLAGS), $L4, $L3
                                                                               #42
                                                                               #42
$L4: (1 ref)
   t113(EFLAGS) = cmp(NE) j[FP], 8
                                                                               #42
                  jcc(NE) t\overline{113}(EFLAGS), $L5, $L3
                                                                               #42
                                                                               #42
$L5: (1 ref)
                                                                               #44
   tv114-(rd) = mov 1
   tv114-(\_rd)<*12>, EFLAGS = add tv114-(\_rd), _j[_FP]
                                                                               #44
                                                                               #44
   j[FP] = mov tv114-(rd)
   \overline{t}11\overline{5} (rd) = mov q[FP]
                                                                               #45
   [t115(rd)] = mov \overline{0}
                                                                               #45
   t116(rd), EFLAGS = imul_j[_FP], 4
                                                                               #46
   tv117-(rd) = mov t116(rd)
                                                                               #46
   tv117-(rd)<*15>, EFLAGS = add tv117-(rd), b[FP]
                                                                               #46
                                                                               #46
   t119(EFLAGS) = cmp(EQ) [tv117-(rd)], 1
                                                                               #46
                  jcc(EQ) t119(EFLAGS), $L7, $L6
                                                                               #46
$L7: (1 ref)
   tv120-(_rd) = mov _i[_FP]
                                                                               #46
   tv120-(rd)<*17>, EFLAGS = add tv120-(rd), j[FP]
                                                                               #46
   t121 (rd), EFLAGS = imul tv120-(rd), \overline{4}
                                                                               #46
   tv122-(rd) = mov t121(rd)
                                                                               #46
   tv122-(_rd)<*19>, EFLAGS = add tv122-(_rd), _a[_FP]
                                                                               #46
   t124 (EFLAGS) = cmp(EQ) [tv122-(rd)], \overline{1}
                                                                               #46
                                                                               #46
                  jcc(EQ) t124(EFLAGS), $L8, $L6
                                                                               #46
$L8: (1 ref)
                                                                               #46
   tv126-(rd) = mov i[FP]
   tv126-(\_rd)<*21>, \overline{E}FL\overline{A}GS = sub tv126-(\_rd), \underline{j}[FP]
                                                                               #46
   tv127-(rd) = mov tv126-(rd)
                                                                               #46
                                                                               #46
   tv127-(rd)<*22>, EFLAGS = add tv127-(rd), 7
   t128 ( r\overline{d}), EFLAGS = imul tv127-( rd), \overline{4}
                                                                               #46
   tv129-(rd) = mov t128(rd)
                                                                               #46
   tv129-(rd)<*24>, EFLAGS = add tv129-(rd), & c
                                                                               #46
                                                                               #46
   t131(EFLAGS) = cmp(EQ) [tv129-(rd)], \tilde{1}
                                                                               #46
                  jcc(EQ) t131(EFLAGS), $L9, $L6
                                                                               #46
$L9: (1 ref)
   t133(rd), EFLAGS = imul _i[FP], 4
                                                                               #48
   tv134-(rd) = mov t133(rd)
                                                                               #48
```

```
AppendixF.txt
                                                                           #48
   tv134-(rd)<*27>, EFLAGS = add tv134-(rd), & x
   t169(r\overline{d}) = mov _j[_FP]
                                                                           #48
                                                                           #48
   [tv134-(rd)] = mov t169(rd)
   t136( rd), EFLAGS = imul _j[_FP], 4
                                                                           #49
   tv137-(rd) = mov t136(rd)
                                                                           #49
   tv137-(rd)<*29>, EFLAGS = add tv137-(rd), b[FP]
                                                                           #49
   [tv137 - (rd)] = mov 0
                                                                           #49
                                                                           #50
   tv139-(rd) = mov i[FP]
   tv139-(rd)<*30>, EFLAGS = add tv139-(rd), j[FP]
                                                                           #50
   t140 ( r\overline{d}), EFLAGS = imul tv139-( rd), \overline{4}
                                                                           #50
   tv141-(rd) = mov t140(rd)
                                                                           #50
                                                                           #50
   tv141-(rd)<*32>, EFLAGS = add tv141-(rd), a[FP]
   [tv141-(rd)] = mov 0
                                                                           #50
   tv143-(rd) = mov i[FP]
                                                                           #51
   tv143-(\underline{rd})<*33>, \overline{EFLAGS} = sub tv143-(rd), j[FP]
                                                                           #51
                                                                           #51
   tv144-(rd) = mov tv143-(rd)
                                                                           #51
   tv144-(rd)<*34>, EFLAGS = add tv144-(rd), 7
   t145(rd), EFLAGS = imul tv144-(rd), 4
                                                                           #51
   tv146-(rd) = mov t145(rd)
                                                                           #51
   tv146-(rd)<*36>, EFLAGS = add tv146-(rd), & c
                                                                           #51
   [tv146-(rd)] = mov 0
                                                                           #51
                                                                           #52
   t148 (EFLAGS) = cmp(LT) i[FP], 8
                 jcc(LT) t\overline{148}(EFLAGS), $L11, $L10
                                                                           #52
                                                                           #52
$L11: (1 ref)
                                                                           #54
   tv149-(rd) = mov 1
                                                                           #54
   tv149-(rd)<*38>, EFLAGS = add tv149-(rd), i[FP]
   [ESP], \{ESP\} = push b[FP], \{ESP\}
                                                                            #54
   [ESP], \{ESP\} = push a[FP], \{ESP\}
                                                                            #54
   [ESP], \{ESP\} = push \_q[\_FP], \{ESP\}
                                                                            #54
   [ESP], \{ESP\} = push tv149-(rd), \{ESP\}
                                                                            #54
   \{-5\}, \{EAX\ ECX\ EDX\ ESP\ EFLAGS\ MMO-MM7\ XMMO-XMM7\ FPO-FP7\ FPUStatus\} = call
  try, $out[ESP], $out[ESP]+32, $out[ESP]+64, $out[ESP]+96, {-5}, {EAX ECX E
DX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7 FPUStatus} [Handler: $L1]
                                                                            #54
   ESP, EFLAGS = add ESP, 16(0\times00000010)
                                                                            #65
                 jmp $L16
$L16: (1 ref)
                                                                            #65
              = mov q[_FP]
                                                                            #55
   t151( rd)
                                                                            #55
   t152(EFLAGS) = cmp(EQ) [t151(rd)], 0
                                                                            #55
                 jcc(EQ) t152(EFLAGS), $L13, $L12
                                                                            #55
$L13: (1 ref)
   t153(rd), EFLAGS = imul j[FP], 4
                                                                            #57
                                                                            #57
   tv154-(rd) = mov t153(rd)
   tv154-(rd)<*42>, EFLAGS = add tv154-(rd), b[ FP]
                                                                            #57
   [tv154-(rd)] = mov 1
                                                                            #57
   tv156-(rd) = mov i[FP]
                                                                            #58
   tv156-(rd)<*43>, EFLAGS = add tv156-(rd), j[FP]
                                                                            #58
   t157(\underline{rd}), EFLAGS = imul tv156-(\underline{rd}), \overline{4}
                                                                            #58
   tv158-(rd) = mov t157(rd)
                                                                           #58
                                                                           #58
   tv158-(rd)<*45>, EFLAGS = add tv158-(rd), a[FP]
   [tv158-(rd)] = mov 1
                                                                            #58
   tv160-(rd) = mov i[FP]
                                                                            #59
   tv160-(rd)<*46>, EFLAGS = sub tv160-(rd), _j[_FP]
                                                                            #59
                                    Page 12
```

```
AppendixF.txt
   tv161-(rd) = mov tv160-(rd)
                                                                              #59
   tv161-(rd)<*47>, EFLAGS = add tv161-(rd), 7
                                                                              #59
   t162(rd), EFLAGS = imul tv161-(rd), \overline{4}
                                                                              #59
   tv163-(rd) = mov t162(rd)
                                                                              #59
   tv163-(rd)<*49>, EFLAGS = add tv163-(rd), & c
                                                                              #59
   [tv163-(rd)] = mov 1
                                                                              #59
                  jmp $L12
                                                                              #55
$L12: (2 refs)
                                                                              #55
                  jmp $L14
                                                                              #62
$L10: (1 ref)
                                                                              #52
                                                                               #62
   t165( rd)
              = mov _q[_FP]
   [t165(rd)] = mov \overline{1}
                                                                              #62
                                                                               #62
                  jmp $L14
$L14: (2 refs)
                                                                               #62
                                                                               #46
                  jmp $L6
                                                                               #46
$L6:
      (4 refs)
                                                                               #64
                  jmp $L2
$L3:
      (2 refs)
                                                                               #42
                  jmp $L15
                                                                               #65
                                                                               #37
$L1:
      (1 ref)
                  UNWIND try
                                                                               #37
$L15: (1 ref)
                                                                               #65
                  EPILOGSTART
                                                                               #65
                                                                               #65
                  EXITFUNC try
                  END try, \{-7\}
                                                                               #65
IR after Linear Scan Register Allocation (flag LinearScan)
                = START try
                                                                               #37
   \{-7\}
   i<*4>, q<*3>, a<*2>, b<*1> = ENTERFUNC try
                                                                               #37
                  PROLOGEND
                                                                               #37
   j[FP]
                = mov 0
                                                                               #40
   t110(EAX) = mov _q[_FP]
[t110(EAX)] = mov _0
                                                                               #41
                                                                               #41
                                                                               #42
                  jmp $L2
$L2: (2 refs)
                                                                               #42
              = mov q[FP]
                                                                               #42
   t111 (EAX)
                                                                               #42
   t112(EFLAGS) = cmp(EQ) [t111(EAX)], 0
                  jcc(EQ) t112(EFLAGS), $L4, $L3
                                                                               #42
                                                                               #42
$L4: (1 ref)
   t113(EFLAGS) = cmp(NE) j[FP], 8
                                                                               #42
                  jcc(NE) t113(EFLAGS), $L5, $L3
                                                                               #42
$L5: (1 ref)
                                                                               #42
   tv114-(EAX) = mov 1
                                                                               #44
   tv114-(EAX)<*12>, EFLAGS = add tv114-(EAX), j[FP]
                                                                               #44
               = mov tv114-(EAX)
                                                                               #44
    j[FP]
   \overline{t115}(EAX) = mov \underline{q}[FP]
[t115(EAX)] = mov \overline{0}
   t115 (EAX)
                                                                               #45
                                                                               #45
   t116(EAX), EFLAGS = imul j[FP], 4
                                                                               #46
   tv117-(EAX) = mov t116(EAX)
                                                                               #46
```

#46

#46

tv117-(EAX)<\*15>, EFLAGS = add tv117-(EAX), b[ FP]

t119(EFLAGS) = cmp(EQ) [tv117-(EAX)], 1

```
AppendixF.txt
                                                                            #46
                 jcc(EQ) t119(EFLAGS), $L7, $L6
                                                                            #46
$L7: (1 ref)
                                                                            #46
   tv120-(EAX) = mov _i[_FP]
   tv120-(EAX)<*17>, \overline{E}FL\overline{A}GS = add tv120-(EAX), \underline{j}[\underline{F}P]
                                                                            #46
                                                                            #46
   t121(EAX), EFLAGS = imul tv120-(EAX), 4
                                                                            #46
   tv122-(EAX) = mov t121(EAX)
                                                                            #46
   tv122-(EAX)<*19>, EFLAGS = add tv122-(EAX), _a[_FP]
                                                                            #46
   t124 (EFLAGS) = cmp(EQ) [tv122-(EAX)], 1
                                                                            #46
                 jcc(EQ) t124(EFLAGS), $L8, $L6
                                                                            #46
$L8: (1 ref)
                                                                            #46
   tv126-(EAX) = mov i[FP]
   tv126-(EAX) < 21>, \overline{E}FL\overline{A}GS = sub tv126-(EAX), j[FP]
                                                                           #46
   tv127-(EAX) = mov tv126-(EAX)
                                                                            #46
                                                                            #46
   tv127-(EAX)<*22>, EFLAGS = add tv127-(EAX), 7
                                                                            #46
   t128 (EAX), EFLAGS = imul tv127-(EAX), 4
                                                                            #46
   tv129-(EAX) = mov t128(EAX)
                                                                            #46
   tv129-(EAX)<*24>, EFLAGS = add tv129-(EAX), &_C
                                                                           #46
   t131(EFLAGS) = cmp(EQ) [tv129-(EAX)], 1
                                                                            #46
                 jcc(EQ) t131(EFLAGS), $L9, $L6
                                                                            #46
$L9: (1 ref)
                                                                            #48
   t133(EAX), EFLAGS = imul i[FP], 4
                                                                            #48
   tv134-(EAX) = mov t133(EAX)
                                                                            #48
   tv134-(EAX)<*27>, EFLAGS = add tv134-(EAX), &_x
                                                                            #48
   t169(ECX) = mov j[FP]
                                                                            #48
   [tv134-(EAX)] = mov t169(ECX)
                                                                            #49
   t136(EAX), EFLAGS = imul j[FP], 4
                                                                            #49
   tv137-(EAX) = mov t136(EAX)
   tv137-(EAX)<*29>, EFLAGS = add tv137-(EAX), _b[ FP]
                                                                           #49
                                                                            #49
   [tv137-(EAX)] = mov 0
                                                                            #50
   tv139-(EAX) = mov i[FP]
                                                                            #50
   tv139-(EAX)<*30>, EFLAGS = add tv139-(EAX), _j[_FP]
                                                                            #50
   t140(EAX), EFLAGS = imul tv139-(EAX), 4
                                                                            #50
   tv141-(EAX) = mov t140(EAX)
                                                                            #50
   tv141-(EAX)<*32>, EFLAGS = add tv141-(EAX), a[_FP]
                                                                            #50
   [tv141-(EAX)] = mov 0
   tv143-(EAX) = mov _i[_FP]
tv143-(EAX)<*33>, EFLAGS = sub tv143-(EAX), _j[_FP]
                                                                            #51
                                                                            #51
                                                                            #51
   tv144-(EAX) = mov tv143-(EAX)
                                                                            #51
   tv144-(EAX)<*34>, EFLAGS = add tv144-(EAX), 7
                                                                            #51
   t145(EAX), EFLAGS = imul tv144-(EAX), 4
                                                                            #51
   tv146-(EAX) = mov t145(EAX)
                                                                            #51
   tv146-(EAX)<*36>, EFLAGS = add tv146-(EAX), &_c
                                                                            #51
   [tv146-(EAX)] = mov 0
                                                                            #52
   t148(EFLAGS) = cmp(LT) i[FP], 8
                                                                            #52
                  jcc(LT) t148(EFLAGS), $L11, $L10
                                                                            #52
$L11: (1 ref)
                                                                            #54
   tv149-(EAX) = mov 1
                                                                            #54
   tv149-(EAX)<*38>, EFLAGS = add tv149-(EAX), _i[_FP]
                                                                            #54
   [ESP], \{ESP\} = push b[ FP], \{ESP\}
                                                                            #54
    [ESP], \{ESP\} = push a[FP], \{ESP\}
   [ESP], \{ESP\} = push q[FP], \{ESP\}
                                                                            #54
    [ESP], \{ESP\} = push tv149-(EAX), \{ESP\}
                                                                            #54
    {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7 FPUStatus} = call
```

AppendixF.txt
try, \$out[ESP], \$out[ESP]+32, \$out[ESP]+64, \$out[ESP]+96, {-5}, {EAX ECX E
FESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7 FPUStatus} [Handler: \$L1]

```
\overline{\text{DX}} ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7 FPUStatus} [Handler: $L1]
    #54
                                                                            #65
                  jmp $L17
                                                                            #65
$L17: (1 ref)
                                                                            #54
   ESP, EFLAGS = add ESP, 16(0\times00000010)
                                                                            #65
                  jmp $L16
                                                                            #65
$L16: (1 ref)
                                                                            #55
   t151 (EAX)
              = mov _q[_FP]
   t152(EFLAGS) = cmp(EQ) [t151(EAX)], 0
                                                                            #55
                                                                            #55
                  jcc(EQ) t152(EFLAGS), $L13, $L12
                                                                            #55
$L13: (1 ref)
                                                                            #57
   t153(EAX), EFLAGS = imul j[FP], 4
                                                                            #57
   tv154-(EAX) = mov t153(EAX)
                                                                            #57
   tv154-(EAX)<*42>, EFLAGS = add tv154-(EAX), _b[_FP]
                                                                            #57
   [tv154-(EAX)] = mov 1
                                                                            #58
   tv156-(EAX) = mov i[FP]
   tv156-(EAX) < 43>, EFLAGS = add tv156-(EAX), _j[_FP]
                                                                            #58
   t157(EAX), EFLAGS = imul tv156-(EAX), 4
                                                                            #58
                                                                            #58
   tv158-(EAX) = mov t157(EAX)
                                                                            #58
   tv158-(EAX) < 45>, EFLAGS = add tv158-(EAX), a[FP]
                                                                            #58
   [tv158-(EAX)] = mov 1
                                                                             #59
   tv160-(EAX) = mov i[FP]
                                                                             #59
   tv160-(EAX) < 46 >, EFLAGS = sub tv160-(EAX), _j[_FP]
                                                                             #59
   tv161-(EAX) = mov tv160-(EAX)
                                                                             #59
   tv161-(EAX)<*47>, EFLAGS = add tv161-(EAX), 7
                                                                             #59
   t162(EAX), EFLAGS = imul tv161-(EAX), 4
                                                                             #59
   tv163-(EAX) = mov t162(EAX)
                                                                             #59
   tv163-(EAX)<*49>, EFLAGS = add tv163-(EAX), &_C
                                                                             #59
   [tv163-(EAX)] = mov 1
                                                                             #55
                  jmp $L12
                                                                             #55
$L12:
      (2 refs)
                                                                             #62
                  jmp $L14
                                                                             #52
$L10: (1 ref)
                                                                             #62
               = mov _q[_FP]
   t165(EAX)
                                                                             #62
   [t165(EAX)] = mov \overline{1}
                                                                             #62
                  jmp $L14
                                                                             #62
$L14: (2 refs)
                                                                             #46
                  jmp $L6
                                                                             #46
$L6: (4 refs)
                                                                             #64
                  jmp $L2
                                                                             #42
$L3:
      (2 refs)
                                                                             #65
                  jmp $L15
                                                                             #37
$L1: (1 ref)
                                                                             #37
                  UNWIND _try
                                                                             #65
$L15: (1 ref)
                                                                             #65
                  EPILOGSTART
                                                                             #65
                  EXITFUNC try
                                                                             #65
                  END try, \{-7\}
```

IR after Stack Allocation (flag StackAlloc)

```
#37
   \{-7\} = START try
   _{i}<*4>, _{q}<*3>, _{a}<*\overline{2}>, _{b}<*1> = ENTERFUNC _try
                                                                               #37
                                                                               #37
                  PROLOGEND
                                                                               #40
               = mov 0
    j[_FP]
   \overline{t}11\overline{0} (EAX) = mov q[FP]
                                                                               #41
   [t110(EAX)] = mov \overline{0}
                                                                               #41
                                                                               #42
                  jmp $L2
                                                                               #42
$L2: (2 refs)
                                                                               #42
              = mov _q[_FP]
   t111 (EAX)
                                                                               #42
   t112(EFLAGS) = cmp(EQ) [t111(EAX)], 0
                                                                               #42
                  jcc(EQ) t112(EFLAGS), $L4, $L3
                                                                               #42
$L4: (1 ref)
                                                                               #42
   t113(EFLAGS) = cmp(NE) j[FP], 8
                 jcc(NE) t\overline{1}13\overline{(EFLAGS)}, $L5, $L3
                                                                               #42
                                                                               #42
$L5: (1 ref)
                                                                               #44
   tv114-(EAX) = mov 1
                                                                               #44
   tv114-(EAX)<*12>, EFLAGS = add tv114-(EAX), _j[_FP]
              = mov tv114-(EAX)
                                                                               #44
   \overline{t115}(EAX) = mov q[_FP]
                                                                               #45
                                                                               #45
   [t115(EAX)] = mov 0
                                                                               #46
   t116(EAX), EFLAGS = imul_j[_FP], 4
                                                                               #46
   tv117-(EAX) = mov t116(EAX)
   tv117-(EAX)<*15>, EFLAGS = add tv117-(EAX), _b[ FP]
                                                                              #46
                                                                               #46
   t119(EFLAGS) = cmp(EQ) [tv117-(EAX)], 1
                                                                               #46
                  jcc(EQ) t119(EFLAGS), $L7, $L6
                                                                               #46
$L7: (1 ref)
   tv120-(EAX) = mov _i[_FP]

tv120-(EAX) < *17>, EFLAGS = add tv120-(EAX), _j[_FP]
                                                                               #46
                                                                               #46
                                                                               #46
   t121(EAX), EFLAGS = imul tv120-(EAX), 4
                                                                               #46
   tv122-(EAX) = mov t121(EAX)
                                                                               #46
   tv122-(EAX)<*19>, EFLAGS = add tv122-(EAX), _a[_FP]
                                                                               #46
   t124 (EFLAGS) = cmp(EQ) [tv122-(EAX)], 1
                                                                               #46
                  jcc(EQ) t124(EFLAGS), $L8, $L6
                                                                               #46
$L8: (1 ref)
                                                                               #46
   tv126-(EAX) = mov i[FP]
   tv126-(EAX)<*21>, \overline{E}FL\overline{A}GS = sub tv126-(EAX), \underline{j}[\underline{FP}]
                                                                               #46
   tv127-(EAX) = mov tv126-(EAX)
                                                                               #46
                                                                               #46
   tv127-(EAX)<*22>, EFLAGS = add tv127-(EAX), 7
                                                                               #46
   t128(EAX), EFLAGS = imul tv127-(EAX), 4
                                                                               #46
   tv129-(EAX) = mov t128(EAX)
                                                                               #46
   tv129-(EAX)<*24>, EFLAGS = add tv129-(EAX), & c
                                                                               #46
   t131(EFLAGS) = cmp(EQ) [tv129-(EAX)], 1
                                                                               #46
                  jcc(EQ) t131(EFLAGS), $L9, $L6
                                                                               #46
$L9: (1 ref)
                                                                               #48
   t133(EAX), EFLAGS = imul i[FP], 4
                                                                               #48
   tv134-(EAX) = mov t133(EAX)
                                                                               #48
   tv134-(EAX)<*27>, EFLAGS = add tv134-(EAX), &_X
   t169(ECX) = mov _j[_FP]
                                                                               #48
                                                                               #48
   [tv134-(EAX)] = mov t169(ECX)
                                                                               #49
   t136(EAX), EFLAGS = imul j[FP], 4
                                                                               #49
   tv137-(EAX) = mov t136(EAX)
                                                                               #49
   tv137-(EAX)<*29>, EFLAGS = add tv137-(EAX), _b[_FP]
                                                                               #49
   [tv137-(EAX)] = mov 0
```

```
#50
  tv139-(EAX) = mov i[FP]
                                                                            #50
   tv139-(EAX)<*30>, EFLAGS = add tv139-(EAX), j[FP]
                                                                            #50
   t140(EAX), EFLAGS = imul tv139-(EAX), 4
   tv141-(EAX) = mov t140(EAX)
                                                                            #50
                                                                            #50
   tv141-(EAX)<*32>, EFLAGS = add tv141-(EAX), a[FP]
                                                                            #50
   [tv141-(EAX)] = mov 0
                                                                            #51
   tv143-(EAX) = mov i[FP]
   tv143-(EAX)<*33>, \overline{E}FL\overline{A}GS = sub tv143-(EAX), j[FP]
                                                                            #51
                                                                            #51
   tv144-(EAX) = mov tv143-(EAX)
   tv144-(EAX)<*34>, EFLAGS = add tv144-(EAX), 7
                                                                            #51
                                                                            #51
   t145(EAX), EFLAGS = imul tv144-(EAX), 4
                                                                            #51
   tv146-(EAX) = mov t145(EAX)
   tv146-(EAX)<*36>, EFLAGS = add tv146-(EAX), & c
                                                                            #51
                                                                             #51
   [tv146-(EAX)] = mov 0
                                                                             #52
   t148 (EFLAGS) = cmp(LT) i[FP], 8
                                                                             #52
                 jcc(LT) t148(EFLAGS), $L11, $L10
                                                                             #52
$L11: (1 ref)
                                                                             #54
   tv149-(EAX) = mov 1
                                                                            #54
   tv149-(EAX)<*38>, EFLAGS = add tv149-(EAX), _i[_FP]
                                                                            #54
   [ESP], \{ESP\} = push b[ FP], \{ESP\}
   [ESP], {ESP} = push _a[_FP], {ESP}
[ESP], {ESP} = push _q[_FP], {ESP}
                                                                             #54
                                                                             #54
                                                                             #54
   [ESP], \{ESP\} = push \overline{t}v1\overline{4}9-(EAX), \{ESP\}
   {-5}, {EAX ECX EDX ESP EFLAGS MMO-MM7 XMMO-XMM7 FPO-FP7 FPUStatus} = call
 try, $out[ESP], $out[ESP]+32, $out[ESP]+64, $out[ESP]+96, {-5}, {EAX ECX E
\overline{\text{DX}} ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7 FPUStatus} [Handler: $L1]
    #54
                                                                             #65
                  jmp $L17
                                                                             #65
$L17: (1 ref)
                                                                             #54
   ESP, EFLAGS = add ESP, 16(0\times00000010)
                                                                             #65
                  jmp $L16
                                                                             #65
$L16: (1 ref)
                                                                             #55
   t151(EAX) = mov q[FP]
                                                                             #55
   t152(EFLAGS) = cmp(EQ) [t151(EAX)], 0
                                                                             #55
                  jcc(EQ) t152(EFLAGS), $L13, $L12
                                                                             #55
$L13: (1 ref)
                                                                             #57
   t153(EAX), EFLAGS = imul j[FP], 4
                                                                             #57
   tv154-(EAX) = mov t153(EAX)
                                                                             #57
   tv154-(EAX)<*42>, EFLAGS = add tv154-(EAX), b[ FP]
                                                                             #57
   [tv154-(EAX)] = mov 1
                                                                             #58
   tv156-(EAX) = mov i[FP]
                                                                             #58
   tv156-(EAX)<*43>, EFLAGS = add tv156-(EAX), _j[_FP]
                                                                             #58
   t157(EAX), EFLAGS = imul tv156-(EAX), 4
                                                                             #58
   tv158-(EAX) = mov t157(EAX)
                                                                             #58
   tv158-(EAX)<*45>, EFLAGS = add tv158-(EAX), a[FP]
                                                                             #58
   [tv158-(EAX)] = mov 1
                                                                             #59
   tv160-(EAX) = mov _i[_FP]
                                                                             #59
   tv160-(EAX)<*46>, EFLAGS = sub tv160-(EAX), j[FP]
                                                                             #59
   tv161-(EAX) = mov tv160-(EAX)
                                                                             #59
   tv161-(EAX)<*47>, EFLAGS = add tv161-(EAX), 7
   t162(EAX), EFLAGS = imul tv161-(EAX), 4
                                                                             #59
                                                                             #59
   tv163-(EAX) = mov t162(EAX)
                                                                             #59
   tv163-(EAX)<*49>, EFLAGS = add tv163-(EAX), & C
                                     Page 17
```

## AppendixF.txt [tv163-(EAX)] = mov 1jmp \$L12 \$L12: (2 refs) jmp \$L14 \$L10: (1 ref) $= mov _q[_FP]$ t165(EAX) $[t165(EAX)] = mov \overline{1}$ jmp \$L14 \$L14: (2 refs) jmp \$L6 \$L6: (4 refs) jmp \$L2 \$L3: (2 refs) jmp \$L15 \$L1: (1 ref) UNWIND try \$L15: (1 ref) **EPILOGSTART** EXITFUNC \_try END \_try, {-7} IR after Frame Generation (flag Frame) = START try $\{-7\}$ i < 4 >, q < 3 >, a < 2 >, b < 1 > = ENTERFUNC \_try $\overline{[ESP]}$ , $\overline{\{ESP\}}$ = $\overline{push}$ $\overline{ESP}$ , $\overline{\{ESP\}}$

#59

#55

#55

#62

#52

#62

#62 #62

#62

#46

#46

#64

#42

#65

#37

#37

#65

#65

#65 #65

```
#37
                                                                           #37
                                                                           #37
                                                                           #37
              = mov ESP
   EBP
   [ESP], {ESP} = push ESP, {ESP}
                                                                           #37
                 PROLOGEND
                                                                           #37
                                                                           #40
               = mov 0
   j[EBP]
                                                                           #41
               = mov _q[EBP]
   t110 (EAX)
   [t110(EAX)] = mov \overline{0}
                                                                           #41
                                                                           #42
                 jmp $L2
                                                                           #42
$L2: (2 refs)
                                                                           #42
             = mov q[EBP]
   t111(EAX)
                                                                           #42
   t112 (EFLAGS) = cmp(EQ) [t111(EAX)], 0
                 jcc(EQ) t112(EFLAGS), $L4, $L3
                                                                           #42
                                                                           #42
$L4: (1 ref)
   t113(EFLAGS) = cmp(NE) j[EBP], 8
                                                                           #42
                 jcc(NE) t113(EFLAGS), $L5, $L3
                                                                           #42
                                                                           #42
$L5: (1 ref)
                                                                           #44
   tv114-(EAX) = mov 1
                                                                           #44
   tv114-(EAX)<*12>, EFLAGS = add tv114-(EAX), j[EBP]
                                                                           #44
   j[EBP] = mov tv114-(EAX)
                                                                           #45
   t115(EAX) = mov q[EBP]
                                                                           #45
   [t115(EAX)] = mov \overline{0}
   t116(EAX), EFLAGS = imul _j[EBP], 4
                                                                           #46
                                                                           #46
   tv117-(EAX) = mov t116(EAX)
                                                                           #46
   tv117-(EAX)<*15>, EFLAGS = add tv117-(EAX), b[EBP]
                                                                           #46
   t119(EFLAGS) = cmp(EQ) [tv117-(EAX)], 1
                                                                           #46
                 jcc(EQ) t119(EFLAGS), $L7, $L6
                                                                           #46
$L7: (1 ref)
```

```
#46
   tv120-(EAX) = mov i[EBP]
                                                                           #46
   tv120-(EAX)<*17>, EFLAGS = add tv120-(EAX), _j[EBP]
                                                                           #46
   t121(EAX), EFLAGS = imul tv120-(EAX), 4
                                                                           #46
   tv122-(EAX) = mov t121(EAX)
   tv122-(EAX)<*19>, EFLAGS = add tv122-(EAX), a[EBP]
                                                                           #46
                                                                           #46
   t124 (EFLAGS) = cmp(EQ) [tv122-(EAX)], 1
                                                                           #46
                 jcc(EQ) t124(EFLAGS), $L8, $L6
                                                                           #46
$L8: (1 ref)
   tv126-(EAX) = mov _i[EBP]
tv126-(EAX)<*21>, EFLAGS = sub tv126-(EAX), _j[EBP]
                                                                           #46
                                                                           #46
                                                                           #46
   tv127-(EAX) = mov tv126-(EAX)
                                                                           #46
   tv127-(EAX)<*22>, EFLAGS = add tv127-(EAX), 7
                                                                           #46
   t128(EAX), EFLAGS = imul tv127-(EAX), 4
                                                                           #46
   tv129-(EAX) = mov t128(EAX)
                                                                           #46
   tv129-(EAX)<*24>, EFLAGS = add tv129-(EAX), & c
                                                                           #46
   t131(EFLAGS) = cmp(EQ) [tv129-(EAX)], 1
                                                                            #46
                 jcc(EQ) t131(EFLAGS), $L9, $L6
                                                                            #46
$L9: (1 ref)
                                                                            #48
   t133(EAX), EFLAGS = imul i[EBP], 4
                                                                            #48
   tv134-(EAX) = mov t133(EAX)
                                                                            #48
   tv134-(EAX)<*27>, EFLAGS = add tv134-(EAX), & X
                                                                            #48
   t169(ECX) = mov _j[EBP]
                                                                            #48
   [tv134-(EAX)] = mov t169(ECX)
                                                                            #49
   t136(EAX), EFLAGS = imul_j[EBP], 4
                                                                            #49
   tv137-(EAX) = mov t136(EAX)
                                                                            #49
   tv137-(EAX)<*29>, EFLAGS = add tv137-(EAX), b[EBP]
                                                                           #49
   [tv137-(EAX)] = mov 0
                                                                           #50
   tv139-(EAX) = mov _i[EBP]
   tv139-(EAX)<*30>, \overline{E}FLAGS = add tv139-(EAX), \underline{j}[EBP]
                                                                            #50
                                                                            #50
   t140(EAX), EFLAGS = imul tv139-(EAX), 4
                                                                            #50
   tv141-(EAX) = mov t140(EAX)
                                                                            #50
   tv141-(EAX)<*32>, EFLAGS = add tv141-(EAX), _a[EBP]
                                                                            #50
   [tv141-(EAX)] = mov 0
                                                                            #51
   tv143-(EAX) = mov i[EBP]
                                                                            #51
   tv143-(EAX)<*33>, EFLAGS = sub tv143-(EAX), j[EBP]
                                                                           #51
   tv144-(EAX) = mov tv143-(EAX)
                                                                           #51
   tv144-(EAX)<*34>, EFLAGS = add tv144-(EAX), 7
   t145(EAX), EFLAGS = imul tv144-(EAX), 4
                                                                            #51
                                                                            #51
   tv146-(EAX) = mov t145(EAX)
                                                                            #51
   tv146-(EAX)<*36>, EFLAGS = add tv146-(EAX), & c
                                                                            #51
   [tv146-(EAX)] = mov 0
                                                                            #52
   t148 (EFLAGS) = cmp(LT) i[EBP], 8
                                                                            #52
                  jcc(LT) t148(EFLAGS), $L11, $L10
                                                                            #52
$L11: (1 ref)
                                                                            #54
   tv149-(EAX) = mov 1
   tv149-(EAX)<*38>, EFLAGS = add tv149-(EAX), i[EBP]
                                                                            #54
                                                                            #54
   [ESP], \{ESP\} = push _b[EBP], \{ESP\}
                                                                            #54
   [ESP], \{ESP\} = push _a[EBP], \{ESP\}
                                                                            #54
   [ESP], \{ESP\} = push _q[EBP], \{ESP\}
                                                                            #54
   [ESP], \{ESP\} = push tv149-(EAX), \{ESP\}
   {-5}, {EAX ECX EDX ESP EFLAGS MMO-MM7 XMMO-XMM7 FPO-FP7 FPUStatus} = call
  try, $out[ESP], $out[ESP]+32, $out[ESP]+64, $out[ESP]+96, {-5}, {EAX ECX E
\overline{\text{DX}} ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7 FPUStatus} [Handler: $L1]
```

```
#54
                                                                            #65
                  jmp $L17
                                                                            #65
$L17: (1 ref)
   ESP, EFLAGS = add ESP, 16(0x00000010)
                                                                            #54
                                                                            #65
                  jmp $L16
                                                                            #65
$L16: (1 ref)
                                                                            #55
              = mov q[EBP]
   t151(EAX)
                                                                            #55
   t152(EFLAGS) = cmp(EQ) [t151(EAX)], 0
                                                                            #55
                  jcc(EQ) t152(EFLAGS), $L13, $L12
                                                                            #55
$L13: (1 ref)
                                                                            #57
   t153(EAX), EFLAGS = imul j[EBP], 4
                                                                            #57
   tv154-(EAX) = mov t153(EAX)
                                                                            #57
   tv154-(EAX) < *42>, EFLAGS = add tv154-(EAX), b[EBP]
                                                                            #57
   [tv154-(EAX)] = mov 1
                                                                            #58
   tv156-(EAX) = mov i[EBP]
                                                                            #58
   tv156-(EAX)<*43>, EFLAGS = add tv156-(EAX), _j[EBP]
                                                                            #58
   t157(EAX), EFLAGS = imul tv156-(EAX), 4
                                                                            #58
   tv158-(EAX) = mov t157(EAX)
                                                                            #58
   tv158-(EAX)<*45>, EFLAGS = add tv158-(EAX), _a[EBP]
                                                                            #58
   [tv158-(EAX)] = mov 1
                                                                            #59
   tv160-(EAX) = mov i[EBP]
   tv160-(EAX) < 46>, \overline{E}FLAGS = sub tv160-(EAX), j[EBP]
                                                                            #59
                                                                            #59
   tv161-(EAX) = mov tv160-(EAX)
                                                                            #59
   tv161-(EAX)<*47>, EFLAGS = add tv161-(EAX), 7
                                                                            #59
   t162(EAX), EFLAGS = imul tv161-(EAX), 4
                                                                            #59
   tv163-(EAX) = mov t162(EAX)
                                                                            #59
   tv163-(EAX)<*49>, EFLAGS = add tv163-(EAX), & c
                                                                            #59
   [tv163-(EAX)] = mov 1
                                                                            #55
                  jmp $L12
                                                                            #55
$L12:
       (2 refs)
                                                                            #62
                  jmp $L14
                                                                            #52
$L10: (1 ref)
                                                                            #62
   t165(EAX)
               = mov q[EBP]
                                                                            #62
   [t165(EAX)] = mov \overline{1}
                                                                            #62
                  jmp $L14
                                                                            #62
$L14: (2 refs)
                                                                            #46
                  jmp $L6
                                                                            #46
$L6:
      (4 refs)
                                                                            #64
                  jmp $L2
                                                                            #42
$L3: (2 refs)
                                                                            #65
                  jmp $L15
                                                                            #37
$L1: (1 ref)
                                                                            #37
                  UNWIND try
                                                                            #65
$L15: (1 ref)
                                                                            #65
                  EPILOGSTART
                                                                            #65
                = mov EBP
   ESP
                                                                            #65
               = pop [ESP], {ESP}
   EBP, {ESP}
                                                                            #65
                = ret {ESP}
   {ESP}
                                                                            #65
                  EXITFUNC try
                                                                            #65
                  END try, \{-7\}
```

IR after Switch Lower (flag SwitchLower)
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```
#37
              = START try
                                                                            #37
   i < 4 >, q < 3 >, a < \sqrt{2} >, b < 1 > = ENTERFUNC _try
                                                                            #37
   \overline{[ESP]}, \{\overline{ESP}\} = \overline{push} EBP, \{ESP\}
                                                                            #37
               = mov ESP
                                                                            #37
   [ESP], {ESP} = push ESP, {ESP}
                                                                            #37
                PROLOGEND
                                                                            #40
               = mov 0
   _j[EBP]
                                                                             #41
   t110 (EAX)
             = mov _q[EBP]
                                                                             #41
   [t110(EAX)] = mov \overline{0}
                                                                             #42
                  jmp $L2
                                                                             #42
$L2: (2 refs)
                                                                             #42
   t111(EAX) = mov q[EBP]
                                                                             #42
   t112(EFLAGS) = cmp(EQ) [t111(EAX)], 0
                                                                             #42
                 jcc(EQ) t112(EFLAGS), $L4, $L3
                                                                             #42
$L4: (1 ref)
                                                                             #42
   t113(EFLAGS) = cmp(NE) j[EBP], 8
                                                                             #42
                  jcc(NE) t\overline{113}(EFLAGS), $L5, $L3
                                                                             #42
$L5: (1 ref)
                                                                             #44
   tv114-(EAX) = mov 1
                                                                            #44
   tv114-(EAX)<*12>, EFLAGS = add tv114-(EAX), j[EBP]
                                                                             #44
   j[EBP] = mov tv114-(EAX)
                                                                             #45
   \overline{t}115 (EAX) = mov q[EBP]
                                                                             #45
   [t115(EAX)] = mov \overline{0}
                                                                             #46
   t116(EAX), EFLAGS = imul j[EBP], 4
                                                                             #46
   tv117-(EAX) = mov t116(EAX)
                                                                             #46
   tv117-(EAX)<*15>, EFLAGS = add tv117-(EAX), b[EBP]
                                                                             #46
   t119(EFLAGS) = cmp(EQ) [tv117-(EAX)], 1
                                                                             #46
                  jcc(EQ) t119(EFLAGS), $L7, $L6
                                                                             #46
$L7: (1 ref)
                                                                             #46
   tv120-(EAX) = mov i[EBP]
                                                                             #46
   tv120-(EAX)<*17>, EFLAGS = add tv120-(EAX), _j[EBP]
                                                                             #46
   t121(EAX), EFLAGS = imul tv120-(EAX), 4
                                                                             #46
   tv122-(EAX) = mov t121(EAX)
                                                                             #46
   tv122-(EAX)<*19>, EFLAGS = add tv122-(EAX), a[EBP]
                                                                             #46
   t124 (EFLAGS) = cmp(EQ) [tv122-(EAX)], 1
                                                                             #46
                  jcc(EQ) t124(EFLAGS), $L8, $L6
                                                                             #46
$L8: (1 ref)
                                                                             #46
   tv126-(EAX) = mov i[EBP]
                                                                             #46
   tv126-(EAX)<*21>, EFLAGS = sub tv126-(EAX), j[EBP]
                                                                             #46
   tv127-(EAX) = mov tv126-(EAX)
                                                                             #46
   tv127-(EAX)<*22>, EFLAGS = add tv127-(EAX), 7
                                                                             #46
   t128(EAX), EFLAGS = imul tv127-(EAX), 4
                                                                             #46
   tv129-(EAX) = mov t128(EAX)
                                                                             #46
   tv129-(EAX)<*24>, EFLAGS = add tv129-(EAX), &_C
   t131(EFLAGS) = cmp(EQ) [tv129-(EAX)], 1
                                                                             #46
                                                                             #46
                  jcc(EQ) t131(EFLAGS), $L9, $L6
                                                                             #46
$L9: (1 ref)
                                                                             #48
   t133(EAX), EFLAGS = imul i[EBP], 4
                                                                             #48
   tv134-(EAX) = mov t133(EAX)
                                                                             #48
   tv134-(EAX)<*27>, EFLAGS = add tv134-(EAX), &_X
                                                                             #48
   t169(ECX) = mov _j[EBP]
                                                                             #48
   [tv134-(EAX)] = mov t169(ECX)
```

AppendixF.txt #49 t136(EAX), EFLAGS = imul j[EBP], 4 #49 tv137-(EAX) = mov t136(EAX)#49 tv137-(EAX)<\*29>, EFLAGS = add tv137-(EAX), b[EBP] #49 [tv137-(EAX)] = mov 0#50 tv139-(EAX) = mov i[EBP]#50 tv139-(EAX)<\*30>, EFLAGS = add tv139-(EAX),  $_j[EBP]$ #50 t140(EAX), EFLAGS = imul tv139-(EAX), 4 #50 tv141-(EAX) = mov t140(EAX)#50 tv141-(EAX)<\*32>, EFLAGS = add tv141-(EAX), a[EBP] #50 [tv141-(EAX)] = mov 0#51 tv143-(EAX) = mov i[EBP]tv143-(EAX)<\*33>,  $\overline{E}FLAGS = sub tv143-(EAX)$ , j[EBP]#51 #51 tv144-(EAX) = mov tv143-(EAX)tv144-(EAX)<\*34>, EFLAGS = add tv144-(EAX), 7 #51 #51 t145(EAX), EFLAGS = imul tv144-(EAX), 4 #51 tv146-(EAX) = mov t145(EAX)#51 tv146-(EAX)<\*36>, EFLAGS = add tv146-(EAX), &\_c #51 [tv146-(EAX)] = mov 0#52 t148 (EFLAGS) = cmp(LT) i[EBP], 8jcc(LT) t148(EFLAGS), \$L11, \$L10 #52 #52 \$L11: (1 ref) #54 tv149-(EAX) = mov 1#54 tv149-(EAX)<\*38>, EFLAGS = add tv149-(EAX), i[EBP] #54 [ESP],  $\{ESP\}$  = push b[EBP],  $\{ESP\}$ #54 [ESP],  $\{ESP\} = push \_a[EBP]$ ,  $\{ESP\}$ #54 [ESP],  $\{ESP\}$  = push q[EBP],  $\{ESP\}$ #54 [ESP],  $\{ESP\}$  = push tv149-(EAX),  $\{ESP\}$ {-5}, {EAX ECX EDX ESP EFLAGS MMO-MM7 XMMO-XMM7 FPO-FP7 FPUStatus} = call try, \$out[ESP], \$out[ESP]+32, \$out[ESP]+64, \$out[ESP]+96, {-5}, {EAX ECX E  $\overline{\text{DX}}$  ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7 FPUStatus} [Handler: \$L1] #54 #65 jmp \$L17 #65 \$L17: (1 ref) #54 ESP, EFLAGS = add ESP, 16(0x00000010)#65 jmp \$L16 #65 \$L16: (1 ref) = mov q[EBP]#55 t151(EAX) t152(EFLAGS) = cmp(EQ) [t151(EAX)], 0#55 #55 jcc(EQ) t152(EFLAGS), \$L13, \$L12 #55 \$L13: (1 ref) #57 t153(EAX), EFLAGS = imul j[EBP], 4 #57 tv154-(EAX) = mov t153(EAX)#57 tv154-(EAX)<\*42>, EFLAGS = add tv154-(EAX), \_b[EBP] #57 [tv154-(EAX)] = mov 1#58 tv156-(EAX) = mov i[EBP]#58 tv156-(EAX)<\*43>, EFLAGS = add tv156-(EAX),  $_j[EBP]$ t157(EAX), EFLAGS = imul tv156-(EAX), 4 #58 #58 tv158-(EAX) = mov t157(EAX)#58 tv158-(EAX)<\*45>, EFLAGS = add tv158-(EAX), \_a[EBP] #58 [tv158-(EAX)] = mov 1#59 tv160-(EAX) = mov i[EBP]#59 tv160-(EAX)<\*46>, EFLAGS = sub tv160-(EAX),  $_j[EBP]$ #59 tv161-(EAX) = mov tv160-(EAX)

```
AppendixF.txt
                                                                               #59
   tv161-(EAX)<*47>, EFLAGS = add tv161-(EAX), 7
                                                                               #59
   t162(EAX), EFLAGS = imul tv161-(EAX), 4
                                                                               #59
   tv163-(EAX) = mov t162(EAX)
                                                                               #59
   tv163-(EAX)<*49>, EFLAGS = add tv163-(EAX), &_c
                                                                               #59
   [tv163-(EAX)] = mov 1
                                                                               #55
                  jmp $L12
                                                                               #55
$L12: (2 refs)
                                                                               #62
                  jmp $L14
                                                                               #52
$L10: (1 ref)
                                                                               #62
   t165(EAX)
              = mov q[EBP]
                                                                               #62
   [t165(EAX)] = mov \overline{1}
                                                                               #62
                  jmp $L14
                                                                               #62
$L14: (2 refs)
                                                                               #46
                  jmp $L6
                                                                               #46
$L6: (4 refs)
                                                                               #64
                  jmp $L2
                                                                               #42
$L3: (2 refs)
                                                                               #65
                  jmp $L15
                                                                               #37
$L1: (1 ref)
                                                                               #37
                  UNWIND try
                                                                               #65
$L15: (1 ref)
                                                                               #65
                  EPILOGSTART
                                                                               #65
                = mov EBP
   ESP
                                                                               #65
   EBP, \{ESP\} = pop [ESP], \{ESP\}
                                                                               #65
                = ret {ESP}
   {ESP}
                                                                               #65
                  EXITFUNC _try
                                                                               #65
                  END try, \{-7\}
IR after Block Layout (flag Block Layout)
                                                                               #37
                = START try
   \{-7\}
    _{i}<*4>, _{q}<*3>, _{a}<*2>, _{b}<*1> = ENTERFUNC _try
                                                                               #37
                                                                               #37
   \overline{[ESP]}, \{\overline{ESP}\} = push EBP, \{ESP\}
                                                                               #37
                = mov ESP
   EBP
                                                                               #37
   [ESP], {ESP} = push ESP, {ESP}
                                                                               #37
                  PROLOGEND
                                                                               #40
   j[EBP]
                = mov 0
                                                                               #41
   t110 (EAX)
              = mov q[EBP]
                                                                               #41
   [t110(EAX)] = mov \overline{0}
                                                                               #42
                  jmp $L2
                                                                               #42
$L2: (2 refs)
                                                                               #42
               = mov q[EBP]
   t111 (EAX)
                                                                               #42
   t112(EFLAGS) = cmp(EQ) [t111(EAX)], 0
                                                                               #42
                   jcc(EQ) t112(EFLAGS), $L4
                                                                               #42
                   jmp $L3
                                                                               #42
$L4: (1 ref)
                                                                               #42
   t113(EFLAGS) = cmp(NE) j[EBP], 8
                                                                               #42
                   jcc(NE) t\overline{1}13(EFLAGS), $L5
                                                                               #42
                   jmp $L3
                                                                               #42
$L5: (1 ref)
                                                                               #44
   tv114-(EAX) = mov 1
                                                                               #44
   tv114-(EAX)<*12>, EFLAGS = add tv114-(EAX), _j[EBP]
                                      Page 23
```

AppendixF.txt #44 j[EBP] = mov tv114-(EAX)#45  $\overline{t}$ 115 (EAX) = mov q[EBP] #45 [t115(EAX)] = mov 0#46 t116(EAX), EFLAGS = imul j[EBP], 4 #46 tv117-(EAX) = mov t116(EAX)#46 tv117-(EAX)<\*15>, EFLAGS = add tv117-(EAX), \_b[EBP] #46 t119(EFLAGS) = cmp(EQ) [tv117-(EAX)], 1#46 icc(EQ) t119(EFLAGS), \$L7 #46 jmp \$L6 #46 \$L7: (1 ref) #46 tv120-(EAX) = mov i[EBP]tv120-(EAX)<\*17>,  $\overline{E}FLAGS = add tv120-(EAX)$ , j[EBP]#46 #46 t121(EAX), EFLAGS = imul tv120-(EAX), 4 #46 tv122-(EAX) = mov t121(EAX)#46 tv122-(EAX)<\*19>, EFLAGS = add tv122-(EAX), \_a[EBP] #46 t124(EFLAGS) = cmp(EQ) [tv122-(EAX)], 1#46 jcc(EQ) t124(EFLAGS), \$L8 #46 jmp \$L6 #46 \$L8: (1 ref) #46 tv126-(EAX) = mov i[EBP]tv126-(EAX) < 21>,  $\overline{E}FLAGS = sub tv126-(EAX)$ , j[EBP]#46 #46 tv127-(EAX) = mov tv126-(EAX)#46 tv127-(EAX)<\*22>, EFLAGS = add tv127-(EAX), 7 #46 t128(EAX), EFLAGS = imul tv127-(EAX), 4 #46 tv129-(EAX) = mov t128(EAX)#46 tv129-(EAX)<\*24>, EFLAGS = add tv129-(EAX), & C #46 t131(EFLAGS) = cmp(EQ) [tv129-(EAX)], 1#46 jcc(EQ) t131(EFLAGS), \$L9 #46 jmp \$L6 #46 \$L9: (1 ref) #48 t133(EAX), EFLAGS = imul i[EBP], 4 #48 tv134-(EAX) = mov t133(EAX)#48 tv134-(EAX)<\*27>, EFLAGS = add tv134-(EAX), &\_x #48  $t169(ECX) = mov _j[EBP]$ #48 [tv134-(EAX)] = mov t169(ECX)#49 t136(EAX), EFLAGS = imul j[EBP], 4 #49 tv137-(EAX) = mov t136(EAX)tv137-(EAX)<\*29>, EFLAGS = add tv137-(EAX), \_b[EBP] #49 #49 [tv137-(EAX)] = mov 0#50 tv139-(EAX) = mov i[EBP]#50 tv139-(EAX)<\*30>, EFLAGS = add tv139-(EAX), \_j[EBP] #50 t140(EAX), EFLAGS = imul tv139-(EAX), 4 #50 tv141-(EAX) = mov t140(EAX)#50 tv141-(EAX)<\*32>, EFLAGS = add tv141-(EAX),  $_a[EBP]$ #50 [tv141-(EAX)] = mov 0tv143-(EAX) = mov \_i[EBP] tv143-(EAX)<\*33>, EFLAGS = sub tv143-(EAX), \_j[EBP] #51 #51 #51 tv144-(EAX) = mov tv143-(EAX)#51 tv144-(EAX)<\*34>, EFLAGS = add tv144-(EAX), 7 #51 t145(EAX), EFLAGS = imul tv144-(EAX), 4 #51 tv146-(EAX) = mov t145(EAX)#51 tv146-(EAX)<\*36>, EFLAGS = add tv146-(EAX), & c

[tv146-(EAX)] = mov 0

#51

AppendixF.txt #52 t148(EFLAGS) = cmp(LT) i[EBP], 8#52 icc(LT) t148(EFLAGS), \$L11 #52 jmp \$L10 #52 \$L11: (1 ref) #54 tv149-(EAX) = mov 1#54 tv149-(EAX)<\*38>, EFLAGS = add tv149-(EAX), \_i[EBP] #54 [ESP],  $\{ESP\} = push _b[EBP]$ ,  $\{ESP\}$ #54 [ESP], {ESP} = push \_a[EBP], {ESP}
[ESP], {ESP} = push \_q[EBP], {ESP} #54 #54 [ESP],  $\{ESP\}$  = push tv149-(EAX),  $\{ESP\}$ {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7 FPUStatus} = call try, \$out[ESP], \$out[ESP]+32, \$out[ESP]+64, \$out[ESP]+96, {-5}, {EAX ECX E  $\overline{\text{DX}}$  ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7 FPUStatus} [Handler: \$L1] #54 #65 jmp \$L17 #65 \$L17: (1 ref) #54 ESP, EFLAGS = add ESP,  $16(0 \times 00000010)$ #65 jmp \$L16 #65 \$L16: (1 ref) #55 = mov q[EBP]t151(EAX) #55 t152(EFLAGS) = cmp(EQ) [t151(EAX)], 0#55 jcc(EQ) t152(EFLAGS), \$L13 #55 jmp \$L12 #55 \$L13: (1 ref) #57 t153(EAX), EFLAGS = imul j[EBP], 4 #57 tv154-(EAX) = mov t153(EAX)#57 tv154-(EAX)<\*42>, EFLAGS = add tv154-(EAX), b[EBP]#57 [tv154-(EAX)] = mov 1#58 tv156-(EAX) = mov i[EBP]#58 tv156-(EAX)<\*43>, EFLAGS = add tv156-(EAX), j[EBP]#58 t157(EAX), EFLAGS = imul tv156-(EAX), 4 #58 tv158-(EAX) = mov t157(EAX)#58 tv158-(EAX)<\*45>, EFLAGS = add tv158-(EAX), \_a[EBP] #58 [tv158-(EAX)] = mov 1#59 tv160-(EAX) = mov i[EBP]#59 tv160-(EAX)<\*46>, EFLAGS = sub tv160-(EAX), \_j[EBP] #59 tv161-(EAX) = mov tv160-(EAX)#59 tv161-(EAX)<\*47>, EFLAGS = add tv161-(EAX), 7 #59 t162(EAX), EFLAGS = imul tv161-(EAX), 4 #59 tv163-(EAX) = mov t162(EAX)#59 tv163-(EAX)<\*49>, EFLAGS = add tv163-(EAX), & c #59 [tv163-(EAX)] = mov 1#55 jmp \$L12 #55 (2 refs) \$L12: #62 jmp \$L14 #52 \$L10: (1 ref) #62 t165(EAX) = mov q[EBP]#62 [t165(EAX)] = mov 1#62 jmp \$L14 #62 \$L14: (2 refs) #46 jmp \$L6 #46 \$L6: (4 refs) #64

jmp \$L2

```
#42
$L3: (2 refs)
                                                                             #65
                  jmp $L15
                                                                             #65
$L15: (1 ref)
                                                                             #65
                  EPILOGSTART
                                                                             #65
               = mov EBP
   ESP
                                                                             #65
   EBP, \{ESP\} = pop [ESP], \{ESP\}
                                                                             #65
               = ret {ESP}
   {ESP}
                                                                             #65
                  EXITFUNC try
                                                                             #37
$L1: (1 ref)
                                                                             #37
                  UNWIND try
                                                                             #65
                  END try, \{-7\}
IR after Flow Optimization (flag FlowOpts)
                                                                             #37
                = START try
   i < 4 >, q < 3 >, a < 2 >, b < 1 > = ENTERFUNC _try [ESP], {ESP} = push EBP, {ESP}
                                                                             #37
                                                                             #37
                                                                             #37
                = mov ESP
   EBP
                                                                             #37
   [ESP], {ESP} = push ESP, {ESP}
                                                                             #37
                 PROLOGEND
                                                                             #40
               = mov 0
    _j[EBP]
                                                                             #41
   \overline{t}110 (EAX) = mov _q[EBP]
                                                                             #41
   [t110(EAX)] = mov 0
                                                                             #42
$L2: (6 refs)
                                                                             #42
   t111(EAX) = mov q[EBP]
                                                                             #42
   t112 (EFLAGS) = cmp(EQ) [t111(EAX)], 0
                                                                             #42
                 jcc(NE) t112(EFLAGS), $L15
                                                                             #42
   t113(EFLAGS) = cmp(NE) j[EBP], 8
                 jcc(EQ) t\overline{1}13(EFLAGS), $L15
                                                                             #42
                                                                             #44
   tv114-(EAX) = mov 1
                                                                             #44
   tv114-(EAX)<*12>, EFLAGS = add tv114-(EAX), _j[EBP]
                                                                             #44
    j[EBP] = mov tv114-(EAX)
                                                                             #45
   \overline{t}115(EAX) = mov q[EBP]
                                                                              #45
    [t115(EAX)] = mov 0
                                                                              #46
   t116(EAX), EFLAGS = imul j[EBP], 4
                                                                              #46
   tv117-(EAX) = mov t116(EAX)
   tv117-(EAX)<*15>, EFLAGS = add tv117-(EAX), b[EBP]
                                                                             #46
                                                                              #46
   t119(EFLAGS) = cmp(EQ) [tv117-(EAX)], 1
                                                                              #46
                  jcc(NE) t119(EFLAGS), $L2
                                                                              #46
    tv120-(EAX) = mov i[EBP]
   tv120-(EAX)<*17>, EFLAGS = add tv120-(EAX), _j[EBP]
                                                                              #46
                                                                              #46
    t121(EAX), EFLAGS = imul tv120-(EAX), 4
                                                                              #46
    tv122-(EAX) = mov t121(EAX)
                                                                              #46
   tv122-(EAX)<*19>, EFLAGS = add tv122-(EAX), _a[EBP]
                                                                              #46
    t124 (EFLAGS) = cmp(EQ) [tv122-(EAX)], 1
                  jcc(NE) t124(EFLAGS), $L2
                                                                              #46
                                                                              #46
    tv126-(EAX) = mov i[EBP]
                                                                              #46
    tv126-(EAX) < 21>, \overline{E}FLAGS = sub tv126-(EAX), j[EBP]
                                                                              #46
    tv127-(EAX) = mov tv126-(EAX)
                                                                              #46
    tv127-(EAX)<*22>, EFLAGS = add tv127-(EAX), 7
                                                                              #46
    t128 (EAX), EFLAGS = imul tv127-(EAX), 4
                                                                              #46
    tv129-(EAX) = mov t128(EAX)
```

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AppendixF.txt
                                                                           #46
  tv129-(EAX)<*24>, EFLAGS = add tv129-(EAX), & c
                                                                            #46
  t131(EFLAGS) = cmp(EQ) [tv129-(EAX)], 1
                                                                            #46
                 jcc(NE) t131(EFLAGS), $L2
                                                                            #48
  t133(EAX), EFLAGS = imul i[EBP], 4
                                                                            #48
  tv134-(EAX) = mov t133(EAX)
  tv134-(EAX)<*27>, EFLAGS = add tv134-(EAX), & x
                                                                            #48
                                                                            #48
             = mov j[EBP]
                                                                            #48
  [tv134-(EAX)] = mov t169(ECX)
                                                                            #49
  t136(EAX), EFLAGS = imul j[EBP], 4
                                                                            #49
  tv137-(EAX) = mov t136(EAX)
                                                                            #49
  tv137-(EAX) < 29>, EFLAGS = add tv137-(EAX), _b[EBP]
                                                                            #49
  [tv137-(EAX)] = mov 0
                                                                            #50
  tv139-(EAX) = mov i[EBP]
                                                                            #50
  tv139-(EAX)<*30>, EFLAGS = add tv139-(EAX), _j[EBP]
                                                                            #50
  t140(EAX), EFLAGS = imul tv139-(EAX), 4
                                                                            #50
  tv141-(EAX) = mov t140(EAX)
                                                                            #50
  tv141-(EAX)<*32>, EFLAGS = add tv141-(EAX), _a[EBP]
                                                                            #50
  [tv141-(EAX)] = mov 0
                                                                            #51
  tv143-(EAX) = mov _i[EBP]
                                                                            #51
  tv143-(EAX) < 33>, \overline{E}FLAGS = sub tv143-(EAX), \underline{j}[EBP]
                                                                            #51
  tv144-(EAX) = mov tv143-(EAX)
  tv144-(EAX)<*34>, EFLAGS = add tv144-(EAX), 7
                                                                            #51
                                                                            #51
  t145(EAX), EFLAGS = imul tv144-(EAX), 4
                                                                            #51
  tv146-(EAX) = mov t145(EAX)
                                                                            #51
  tv146-(EAX) < *36>, EFLAGS = add tv146-(EAX), & c
                                                                            #51
   [tv146-(EAX)] = mov 0
                                                                            #52
  t148 (EFLAGS) = cmp(LT) i[EBP], 8
                                                                            #52
                 jcc(GE) t\overline{1}48(EFLAGS), $L10
                                                                            #54
  tv149-(EAX) = mov 1
                                                                            #54
  tv149-(EAX) < *38>, EFLAGS = add tv149-(EAX), _i[EBP]
                                                                            #54
   [ESP], \{ESP\} = push b[EBP], \{ESP\}
   [ESP], {ESP} = push _a[EBP], {ESP}
[ESP], {ESP} = push _q[EBP], {ESP}
                                                                            #54
                                                                            #54
   [ESP], \{ESP\} = push \overline{tv}149-(EAX), \{ESP\}
   {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7 FPUStatus} = call
  try, $out[ESP], $out[ESP]+32, $out[ESP]+64, $out[ESP]+96, {-5}, {EAX ECX E
DX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7 FPUStatus} [Handler: $L1]
    #54
                                                                            #54
   ESP, EFLAGS = add ESP, 16(0\times00000010)
                                                                            #55
   t151(EAX) = mov q[EBP]
                                                                            #55
   t152 (EFLAGS) = cmp(EQ) [t151(EAX)], 0
                                                                            #55
                  jcc(NE) t152(EFLAGS), $L2
                                                                            #57
   t153(EAX), EFLAGS = imul_j[EBP], 4
                                                                            #57
   tv154-(EAX) = mov t153(EAX)
                                                                            #57
   tv154-(EAX)<*42>, EFLAGS = add tv154-(EAX), b[EBP]
                                                                            #57
   [tv154-(EAX)] = mov 1
                                                                            #58
   tv156-(EAX) = mov i[EBP]
   tv156-(EAX)<*43>, EFLAGS = add tv156-(EAX), _j[EBP]
                                                                            #58
                                                                            #58
   t157(EAX), EFLAGS = imul tv156-(EAX), 4
                                                                            #58
   tv158-(EAX) = mov t157(EAX)
                                                                            #58
   tv158-(EAX)<*45>, EFLAGS = add tv158-(EAX), a[EBP]
                                                                            #58
   [tv158-(EAX)] = mov 1
                                                                            #59
   tv160-(EAX) = mov i[EBP]
```

```
AppendixF.txt
                                                                            #59
  tv160-(EAX)<*46>, EFLAGS = sub tv160-(EAX), _j[EBP]
                                                                            #59
  tv161-(EAX) = mov tv160-(EAX)
                                                                            #59
   tv161-(EAX)<*47>, EFLAGS = add tv161-(EAX), 7
                                                                            #59
   t162(EAX), EFLAGS = imul tv161-(EAX), 4
                                                                            #59
   tv163-(EAX) = mov t162(EAX)
                                                                            #59
   tv163-(EAX)<*49>, EFLAGS = add tv163-(EAX), & c
                                                                            #59
   [tv163-(EAX)] = mov 1
                                                                            #62
                 jmp $L2
                                                                            #52
$L10: (1 ref)
                                                                            #62
             = mov q[EBP]
   t165(EAX)
                                                                            #62
   [t165(EAX)] = mov 1
                                                                            #64
                 jmp $L2
                                                                            #65
$L15: (2 refs)
                                                                            #65
                 EPILOGSTART
                                                                            #65
               = mov EBP
                                                                            #65
   EBP, \{ESP\} = pop [ESP], \{ESP\}
                                                                            #65
               = ret {ESP}
   {ESP}
                                                                            #65
                 EXITFUNC _try
                                                                            #37
$L1: (1 ref)
                                                                            #37
                 UNWIND try
                                                                            #65
                 END try, \{-7\}
IR after Encoding, Listing, COFF Emission (flag Encode)
                                                                            #37
               = START try
                                                                            #37
    i<*4>, q<*3>, a<*2>, b<*1> = ENTERFUNC try
                                                                            #37
   \overline{[ESP]}, \{\overline{ESP}\} = \overline{push} EBP, \{ESP\}
                                                                            #37
               = mov ESP
   EBP
                                                                            #37
   [ESP], {ESP} = push ESP, {ESP}
                                                                            #37
                 PROLOGEND
                                                                            #40
               = mov 0
   j[EBP]
                                                                            #41
               = mov q[EBP]
   t110(EAX)
                                                                            #41
   [t110(EAX)] = mov 0
                                                                            #42
$L2: (6 refs)
                                                                            #42
   t111(EAX) = mov q[EBP]
                                                                            #42
   t112(EFLAGS) = cmp(EQ) [t111(EAX)], 0
                 jne(NE) t112(EFLAGS), $L15
                                                                            #42
                                                                            #42
   t113(EFLAGS) = cmp(NE) j[EBP], 8
                 je(EQ) t1\overline{13}(EFLAGS), $L15
                                                                            #42
                                                                            #44
   tv114-(EAX) = mov 1
                                                                            #44
   tv114-(EAX)<*12>, EFLAGS = add_tv114-(EAX), j[EBP]
                                                                            #44
    j[EBP] = mov tv114-(EAX)
                                                                             #45
              = mov q[EBP]
   t115 (EAX)
                                                                             #45
   [t115(EAX)] = mov 0
                                                                             #46
   tv116-(EAX)<*14>, EFLAGS = imul j[EBP], 4
                                                                            #46
   tv117-(EAX)<*15>, EFLAGS = add tv117-(EAX), b[EBP]
                                                                            #46
   t119(EFLAGS) = cmp(EQ) [tv117-(EAX)], 1
                                                                             #46
                  jne(NE) t119(EFLAGS), $L2
                                                                             #46
   tv120-(EAX) = mov i[EBP]
                                                                             #46
   tv120-(EAX) < 17>, \overline{E}FLAGS = add tv120-(EAX), \underline{j}[EBP]
                                                                            #46
   tv121-(EAX)<*18>, EFLAGS = imul tv120-(EAX), 4
                                                                            #46
   tv122-(EAX)<*19>, EFLAGS = add tv122-(EAX), a[EBP]
                                                                             #46
   t124 (EFLAGS) = cmp(EQ) [tv122-(EAX)], 1
                                     Page 28
```

```
AppendixF.txt
                  jne(NE) t124(EFLAGS), $L2
                                                                              #46
                                                                              #46
  tv126-(EAX) = mov i[EBP]
                                                                              #46
  tv126-(EAX)<*21>, EFLAGS = sub tv126-(EAX), _j[EBP]
  tv127-(EAX)<*22>, EFLAGS = add tv127-(EAX), \overline{7}
                                                                              #46
                                                                              #46
  tv128-(EAX)<*23>, EFLAGS = imul tv127-(EAX), 4
                                                                              #46
  tv129-(EAX)<*24>, EFLAGS = add tv129-(EAX), & c
                                                                              #46
  t131(EFLAGS) = cmp(EQ) [tv129-(EAX)], 1
                                                                              #46
                  jne(NE) t131(EFLAGS), $L2
                                                                               #48
  tv133-(EAX)<*26>, EFLAGS = imul_i[EBP], 4
                                                                               #48
  tv134-(EAX)<*27>, EFLAGS = add tv134-(EAX), &_X
                                                                               #48
   t169(ECX) = mov_j[EBP]
                                                                               #48
   [tv134-(EAX)] = mov t169(ECX)
                                                                               #49
   tv136-(EAX)<*28>, EFLAGS = imul j[EBP], 4
                                                                               #49
   tv137-(EAX)<*29>, EFLAGS = add tv137-(EAX), b[EBP]
                                                                               #49
   [tv137-(EAX)] = mov 0
                                                                               #50
   tv139-(EAX) = mov _i[EBP]
   tv139-(EAX)<*30>, EFLAGS = add tv139-(EAX), _j[EBP]
tv140-(EAX)<*31>, EFLAGS = imul tv139-(EAX), 4
                                                                               #50
                                                                               #50
                                                                               #50
   tv141-(EAX) < 32>, EFLAGS = add tv141-(EAX), _a[EBP]
                                                                               #50
   [tv141-(EAX)] = mov 0
                                                                               #51
   tv143-(EAX) = mov i[EBP]
   tv143-(EAX)<*33>, EFLAGS = sub tv143-(EAX), _j[EBP]
tv144-(EAX)<*34>, EFLAGS = add tv144-(EAX), _7
                                                                               #51
                                                                               #51
                                                                               #51
   tv145-(EAX)<*35>, EFLAGS = imul tv144-(EAX), 4
                                                                               #51
   tv146-(EAX)<*36>, EFLAGS = add tv146-(EAX), & c
                                                                               #51
   [tv146-(EAX)] = mov 0
                                                                               #52
   t148 (EFLAGS) = cmp(LT) i[EBP], 8
                                                                               #52
                  jge(GE) t148(EFLAGS), $L10
                                                                               #54
   tv149-(EAX) = mov 1
                                                                               #54
   tv149-(EAX)<*38>, EFLAGS = add tv149-(EAX), i[EBP]
                                                                               #54
   [ESP], \{ESP\} = push b[EBP], \{ESP\}
                                                                               #54
   [ESP], \{ESP\} = push [EBP], \{ESP\}
                                                                               #54
   [ESP], \{ESP\} = push _q[EBP], \{ESP\}
                                                                               #54
   [ESP], \{ESP\} = push tv149-(EAX), \{ESP\}
   {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7 FPUStatus} = call
  try, $out[ESP], $out[ESP]+32, $out[ESP]+64, $out[ESP]+96, {-5}, {EAX ECX E
\overline{\text{DX}} ESP EFLAGS MMO-MM7 XMMO-XMM7 FPO-FP7 FPUStatus} [Handler: $L1]
    #54
                                                                               #54
   ESP, EFLAGS = add ESP, 16(0x00000010)
                                                                               #55
   t151(EAX) = mov q[EBP]
                                                                               #55
   t152(EFLAGS) = cmp(EQ) [t151(EAX)], 0
                                                                               #55
                  jne(NE) t152(EFLAGS), $L2
                                                                               #57
   tv153-(EAX)<*41>, EFLAGS = imul _j[EBP], 4
   tv154-(EAX)<*42>, EFLAGS = add tv154-(EAX), b[EBP]
                                                                               #57
                                                                               #57
   [tv154-(EAX)] = mov 1
                                                                               #58
   tv156-(EAX) = mov _i[EBP]
tv156-(EAX)<*43>, EFLAGS = add tv156-(EAX), _j[EBP]
                                                                               #58
                                                                               #58
   tv157-(EAX)<*44>, EFLAGS = imul tv156-(EAX), 4
                                                                               #58
   tv158-(EAX)<*45>, EFLAGS = add tv158-(EAX), a[EBP]
                                                                               #58
   [tv158-(EAX)] = mov 1
                                                                               #59
   tv160-(EAX) = mov _i[EBP]
                                                                               #59
   tv160-(EAX)<*46>, EFLAGS = sub tv160-(EAX), _j[EBP]
   tv161-(EAX)<*47>, EFLAGS = add tv161-(EAX), \overline{7}
                                                                               #59
```

```
AppendixF.txt
                                                                                 #59
   tv162-(EAX)<*48>, EFLAGS = imul tv161-(EAX), 4
                                                                                 #59
   tv163-(EAX)<*49>, EFLAGS = add tv163-(EAX), & C
                                                                                 #59
   [tv163-(EAX)] = mov 1
                                                                                 #62
                   jmp $L2
                                                                                 #52
$L10: (1 ref)
                                                                                 #62
              = mov q[EBP]
   t165(EAX)
                                                                                 #62
   [t165(EAX)] = mov \overline{1}
                                                                                 #64
                   jmp $L2
                                                                                 #65
$L15: (2 refs)
                                                                                 #65
                   EPILOGSTART
                                                                                 #65
                = mov EBP
                                                                                 #65
   EBP, \{ESP\} = pop [ESP], \{ESP\}
                                                                                 #65
                 = ret {ESP}
   {ESP}
                                                                                 #65
                   EXITFUNC try
                                                                                 #37
$L1: (1 ref)
                                                                                 #37
                   UNWIND try
                                                                                 #65
                   END try, \{-7\}
IR after LIR Phases (flag LIR Phases) [SubPhaseList]
                                                                                 #37
                 = START try
                                                                                 #37
    i < 4 >, q < 3 >, a < 2 >, b < 1 > = ENTERFUNC _try
                                                                                  #37
   \overline{[ESP]}, \{\overline{ESP}\} = push EBP, \{ESP\}
                                                                                  #37
                = mov ESP
                                                                                  #37
   [ESP], \{ESP\} = push ESP, \{ESP\}
                                                                                  #37
                   PROLOGEND
                                                                                  #40
                 = mov 0
    j[EBP]
                                                                                  #41
               = mov q[EBP]
   t110 (EAX)
                                                                                  #41
   [t110(EAX)] = mov 0
                                                                                  #42
$L2: (6 refs)
                                                                                  #42
               = mov q[EBP]
   t111 (EAX)
                                                                                  #42
   t112(EFLAGS) = cmp(EQ) [t111(EAX)], 0
                                                                                  #42
                  jne(NE) t112(EFLAGS), $L15
                                                                                  #42
   t113(EFLAGS) = cmp(NE) j[EBP], 8
                                                                                  #42
                   je(EQ) t113(EFLAGS), $L15
                                                                                  #44
   tv114-(EAX) = mov 1
   tv114-(EAX)<*12>, EFLAGS = add tv114-(EAX), j[EBP]
                                                                                  #44
                                                                                  #44
    j[EBP] = mov tv114-(EAX)
                                                                                  #45
   \overline{t}115(EAX) = mov q[EBP]
                                                                                  #45
    [t115(EAX)] = mov \overline{0}
   tv116-(EAX)<*14>, EFLAGS = imul _j[EBP], 4
                                                                                  #46
   tv117-(EAX)<*15>, EFLAGS = add tv117-(EAX), _b[EBP]
                                                                                  #46
                                                                                  #46
   t119(EFLAGS) = cmp(EQ) [tv117-(EAX)], 1
                                                                                  #46
                   jne(NE) t119(EFLAGS), $L2
   tv120-(EAX) = mov _i[EBP]
tv120-(EAX)<*17>, EFLAGS = add tv120-(EAX), _j[EBP]
tv121-(EAX)<*18>, EFLAGS = imul tv120-(EAX), 4
                                                                                  #46
                                                                                  #46
                                                                                  #46
                                                                                  #46
    tv122-(EAX)<*19>, EFLAGS = add tv122-(EAX), _a[EBP]
                                                                                  #46
    t124(EFLAGS) = cmp(EQ) [tv122-(EAX)], 1
                                                                                  #46
                    jne(NE) t124(EFLAGS), $L2
                                                                                  #46
    tv126-(EAX) = mov i[EBP]
                                                                                  #46
    tv126-(EAX)<*21>, \overline{E}FLAGS = sub tv126-(EAX), \underline{j}[EBP]
```

```
AppendixF.txt
                                                                            #46
  tv127-(EAX)<*22>, EFLAGS = add tv127-(EAX), 7
  tv128-(EAX)<*23>, EFLAGS = imul tv127-(EAX), 4
                                                                            #46
  tv129-(EAX)<*24>, EFLAGS = add tv129-(EAX), & c
                                                                            #46
                                                                            #46
  t131(EFLAGS) = cmp(EQ) [tv129-(EAX)], 1
                 jne(NE) t131(EFLAGS), $L2
                                                                            #46
                                                                            #48
  tv133-(EAX)<*26>, EFLAGS = imul_i[EBP], 4
  tv134-(EAX)<*27>, EFLAGS = add tv134-(EAX), & x
                                                                            #48
   t169(ECX) = mov _j[EBP]
                                                                            #48
   [tv134-(EAX)] = mov t169(ECX)
                                                                            #48
   tv136-(EAX)<*28>, EFLAGS = imul _j[EBP], 4
                                                                            #49
                                                                            #49
   tv137-(EAX)<*29>, EFLAGS = add tv137-(EAX), b[EBP]
                                                                            #49
   [tv137-(EAX)] = mov 0
                                                                            #50
   tv139-(EAX) = mov i[EBP]
  tv139-(EAX)<*30>, \overline{E}FLAGS = add tv139-(EAX), \underline{j}[EBP]
                                                                            #50
                                                                            #50
   tv140-(EAX)<*31>, EFLAGS = imul tv139-(EAX), 4
                                                                            #50
   tv141-(EAX)<*32>, EFLAGS = add tv141-(EAX), a[EBP]
                                                                            #50
   [tv141-(EAX)] = mov 0
   tv143-(EAX) = mov i[EBP]
                                                                            #51
  tv143-(EAX)<*33>, EFLAGS = sub tv143-(EAX), _j[EBP]
+v144-(EAX)<*34>, EFLAGS = add tv144-(EAX), 7
                                                                            #51
                                                                            #51
   tv144-(EAX)<*34>, EFLAGS = add tv144-(EAX),
                                                                            #51
   tv145-(EAX)<*35>, EFLAGS = imul tv144-(EAX), 4
   tv146-(EAX)<*36>, EFLAGS = add tv146-(EAX), & c
                                                                            #51
                                                                            #51
   [tv146-(EAX)] = mov 0
                                                                             #52
   t148 (EFLAGS) = cmp(LT) i[EBP], 8
                 jge(GE) t\overline{148}(EFLAGS), $L10
                                                                             #52
                                                                             #54
   tv149-(EAX) = mov 1
   tv149-(EAX)<*38>, EFLAGS = add tv149-(EAX), i[EBP]
                                                                             #54
   [ESP], \{ESP\} = push \_b[EBP], \{ESP\}
                                                                             #54
                                                                             #54
   [ESP], \{ESP\} = push a[EBP], \{ESP\}
                                                                             #54
   [ESP], \{ESP\} = push q[EBP], \{ESP\}
                                                                             #54
   [ESP], \{ESP\} = push tv149-(EAX), \{ESP\}
   {-5}, {EAX ECX EDX ESP EFLAGS MMO-MM7 XMMO-XMM7 FPO-FP7 FPUStatus} = call
 try, $out[ESP], $out[ESP]+32, $out[ESP]+64, $out[ESP]+96, {-5}, {EAX ECX E
\overline{DX} \overline{ESP} EFLAGS MMO-MM7 XMMO-XMM7 FPO-FP7 FPUStatus} [Handler: $L1]
                                                                             #54
   ESP, EFLAGS = add ESP, 16(0\times00000010)
   t151(EAX) = mov q[EBP]
                                                                             #55
   t152 (EFLAGS) = cmp(EQ) [t151(EAX)], 0
                                                                             #55
                                                                             #55
                 jne(NE) t152(EFLAGS), $L2
                                                                             #57
   tv153-(EAX)<*41>, EFLAGS = imul j[EBP], 4
                                                                             #57
   tv154-(EAX)<*42>, EFLAGS = add tv154-(EAX), b[EBP]
                                                                             #57
   [tv154-(EAX)] = mov 1
                                                                             #58
   tv156-(EAX) = mov _i[EBP]
                                                                             #58
   tv156-(EAX)<*43>, EFLAGS = add tv156-(EAX), _j[EBP]
   tv157-(EAX)<*44>, EFLAGS = imul tv156-(EAX), 4
                                                                             #58
   tv158-(EAX)<*45>, EFLAGS = add tv158-(EAX), a[EBP]
                                                                             #58
                                                                             #58
   [tv158-(EAX)] = mov 1
                                                                             #59
   tv160-(EAX) = mov _i[EBP]
                                                                             #59
   tv160-(EAX)<*46>, EFLAGS = sub tv160-(EAX), j[EBP]
                                                                            #59
   tv161-(EAX)<*47>, EFLAGS = add tv161-(EAX), 7
                                                                            #59
   tv162-(EAX)<*48>, EFLAGS = imul tv161-(EAX), 4
                                                                            #59
   tv163-(EAX)<*49>, EFLAGS = add tv163-(EAX), & c
   [tv163-(EAX)] = mov 1
                                                                             #59
```

	AppendixF.txt	
	jmp \$L2	#62
\$L10: (1 ref)		#52
	$= mov _q[EBP]$	#62
[t165(EAX)]		#62 #64
	jmp \$L2	#65
\$L15: (2 refs		#65
ESP	EPILOGSTART	#65
	= mov EBP = pop [ESP], {ESP}	#65
	= ret {ESP}	#65
(ESF)	EXITFUNC try	#65
\$L1: (1 ref)		#37
VII. (1 101)	UNWIND try	#37
	END $tr\overline{y}$ , $\{-7\}$	#65
	<b>-</b> '	
	rious phases for second part of program*/	
IR after CIL R	Reader (flag cil)	
( 7)	- CTART main	#68
{ - / }	= START _main ENTERFUNC _main	#68
doitagain	= ASSIGN 1	#78
_dortagain	GOTO \$L2	#78
\$L3: (1 ref)	3310 122	#78
t109	= ASSIGN doitagain	#78
t110	<pre>= ASSIGN _doitagain = ADD t109, 1</pre>	#78
doitagain	= ASSIGN t110	#78
	GOTO \$L2	#78
\$L2: (2 refs)	(000/0,0001770)	#78 #78
t111	= CMP(LE) doitagain, 6000(0x00001770)	#78
	CBRANCH( $\overline{\text{LE}}$ ) t111, \$L5, \$L4	#78
\$L5: (1 ref)	= ASSIGN 0	#80
_i	GOTO \$L6	#81
\$L6: (2 refs)		#81
t112		#81
CIIZ	CBRANCH(LE) t112, \$L8, \$L7	#81
\$L8: (1 ref)		#81
t113	$= CMP(GE) _i, 1$	#83
	CBRANCH(GE) t113, \$L10, \$L9	#83
\$L10: (1 ref)		#83
t114	= CMP(LE)  i,  8	#83 #83
	CBRANCH(LE) t114, \$L11, \$L9	#83
\$L11: (1 ref)		#83
t116	= MUL _i, 4	#83
t117	= SUBSCRIPT &_a, t116 = ASSIGN t117	#83
t118 [t118]	= ASSIGN CITY = ASSIGN 1	#83
[[110]	GOTO \$L9	#83
\$L9: (3 refs)		#83
t119	= CMP(GE) i, 2	#84
	CBRANCH( $\overline{GE}$ ) t119, \$L13, \$L12	#84
\$L13: (1 ref)		#84
·	Page 32	

```
#84
  t121
              = MUL i, 4
                                                                           #84
              = SUBS\overline{C}RIPT \& b, t121
  t122
                                                                           #84
  t123
              = ASSIGN t122
                                                                           #84
               = ASSIGN 1
  [t123]
                                                                           #84
                 GOTO $L12
                                                                           #84
$L12: (2 refs)
                                                                           #85
               = CMP(LE) i, 14(0x0000000e)
  t124
                                                                           #85
                 CBRANCH(LE) t124, $L15, $L14
                                                                           #85
$L15: (1 ref)
                                                                           #85
               = MUL i, 4
  t126
                                                                           #85
               = SUBSCRIPT & c, t126
  t127
                                                                           #85
               = ASSIGN t127
  t128
                                                                           #85
               = ASSIGN 1
  [t128]
                                                                           #85
                 GOTO $L14
                                                                           #85
$L14: (2 refs)
                                                                           #86
               = ADD i, 1
  t129
                                                                           #86
               = ASSIGN t129
  _i
                                                                           #87
                 GOTO $L6
                                                                           #81
$L7: (1 ref)
                                                                           #89
               = CALL _try, 1, &_q, &_b, &_a, {-5} [Handler: $L1]
  \{-5\}
                                                                           #90
   t131
               = CMP(EQ) q, 1
                 CBRANCH(\overline{E}Q) t131, $L17, $L16
                                                                           #90
                                                                           #90
$L17: (1 ref)
                                                                           #91
   _i
               = ASSIGN 1
                                                                           #92
                 GOTO $L18
                                                                           #92
$L18: (2 refs)
                                                                           #92
               = CMP(LE) i, 8
   t132
                                                                           #92
                 CBRANCH(\overline{LE}) t132, $L20, $L19
                                                                           #92
$L20: (1 ref)
                                                                           #93
               = ADD i, 1
   t133
                                                                           #93
               = ASSIGN t133
   _i
                                                                           #93
                 GOTO $L18
                                                                           #92
$L19: (1 ref)
                                                                           #95
                 GOTO $L21
                                                                           #90
$L16: (1 ref)
               = CALL printf, &$SG1197, {-5} [Handler: $L1]
                                                                           #97
   {-5}
               = CALL exit, 0, {-5} [Handler: $L1]
                                                                           #98
   \{-5\}
                  GOTO $L21
                                                                           #95
                                                                           #95
$L21: (2 refs)
                                                                           #100
                  GOTO $L3
                                                                           #78
$L4: (1 ref)
                = CALL printf, &$SG1198, {-5} [Handler: $L1]
                                                                           #101
   {-5}
                                                                           #108
                  RETURN 0
                                                                            #108
                  GOTO $L22
                                                                            #68
$L1: (4 refs)
                                                                            #68
                  UNWIND main
                                                                            #108
$L22: (1 ref)
                                                                            #109
                  EXITFUNC main
                                                                            #109
                  END main, \{-7\}
```

IR after Type Checker (flag Type Checker)

	Appendix: .cxc	
{-7}	= START main	#68
•	ENTERFUNC main	#68
doitagain	= ASSIGN 1	#78
_dorcagarn	GOTO \$L2	#78
(1 5)		#78
\$L3: (1 ref)		#78
t109	<pre>= ASSIGN _doitagain = ADD t109, 1</pre>	
t110	= ADD t109, 1	#78
doitagain	= ASSIGN t110	#78
_	GOTO \$L2	#78
\$L2: (2 refs)	)	#78
	= CMP(LE) doitagain, 6000(0x00001770)	#78
	CBRANCH(LE) t111, \$L5, \$L4	#78
\$L5: (1 ref)		#78
	= ASSIGN 0	#80
_i		#81
	GOTO \$L6	#81
\$L6: (2 refs)	)	#81
t112	= CMP(LE) i, 16(0x00000010)	
	CBRANCH( $\overline{\text{LE}}$ ) t112, \$L8, \$L7	#81
\$L8: (1 ref)		#81
t113	$= CMP(GE) _i, 1$	#83
	$CBRANCH(\overline{GE})$ t113, \$L10, \$L9	#83
\$L10: (1 ref)	)	#83
	= CMP(LE) i, 8	#83
CIII	CBRANCH(LE) t114, \$L11, \$L9	#83
CI11. (1 mof)		#83
\$L11: (1 ref)		#83
t116	= MUL i, 4	#83
t117	= SUBSCRIPT &_a, t116	
t118	= ASSIGN t117	#83
[t118]	= ASSIGN 1	#83
	GOTO \$L9	#83
\$L9: (3 refs)		#83
	= CMP(GE) i, 2	#84
02	CBRANCH $(\overline{GE})$ t119, \$L13, \$L12	#84
\$L13: (1 ref)		#84
	= MUL _i, 4	#84
L121 +122	= SUBSCRIPT &_b, t121	#84
1122	- 5005CRIFT &_D, CIZI	#84
t123	= ASSIGN t122	#84
[t123]	= ASSIGN 1	#84
	GOTO \$L12	
\$L12: (2 refs	(s)	#84
t124	$= CMP(LE) _i, 14(0x0000000e)$	#85
	CBRANCH( $\overline{LE}$ ) t124, \$L15, \$L14	#85
\$L15: (1 ref)		#85
t126	= MUL i, 4	#85
t127	= SUBSCRIPT & c, t126	#85
t128	= ASSIGN t127	#85
[t128]		#85
[(120]	GOTO \$L14	#85
ĊT14. /O		#85
\$L14: (2 refs		#86
t129	= ADD _i, 1	#86
_i	= ASSIGN t129	
	GOTO \$L6	#87
\$L7: (1 ref)		#81

```
AppendixF.txt
               = CALL _try, 1, &_q, &_b, &_a, {-5} [Handler: $L1]
                                                                             #89
   \{-5\}
                                                                             #90
               = CMP(E\overline{Q}) q, 1
   t131
                                                                             #90
                 CBRANCH(\overline{EQ}) t131, $L17, $L16
                                                                             #90
$L17: (1 ref)
                                                                             #91
               = ASSIGN 1
   _i
                                                                             #92
                 GOTO $L18
                                                                             #92
$L18: (2 refs)
                                                                             #92
                = CMP(LE) _i, 8
   t132
                  CBRANCH(\overline{LE}) t132, $L20, $L19
                                                                             #92
                                                                             #92
$L20: (1 ref)
                                                                             #93
                = ADD i, 1
   t133
                                                                             #93
                = ASSIGN t133
   i
                                                                             #93
                  GOTO $L18
                                                                             #92
$L19: (1 ref)
                                                                             #95
                  GOTO $L21
                                                                             #90
$L16: (1 ref)
                = CALL _printf, &$SG1197, {-5} [Handler: $L1]
                                                                             #97
   {-5}
                = CALL exit, 0, \{-5\} [Handler: $L1]
                                                                             #98
   \{-5\}
                                                                             #95
                  GOTO $L21
                                                                             #95
$L21: (2 refs)
                                                                             #100
                  GOTO $L3
                                                                             #78
$L4: (1 ref)
                                                                             #101
                = CALL printf, &$SG1198, {-5} [Handler: $L1]
  {-5}
                                                                             #108
                  RETURN 0
                                                                             #108
                  GOTO $L22
                                                                             #68
$L1: (4 refs)
                                                                             #68
                  UNWIND main
                                                                             #108
$L22: (1 ref)
                                                                             #109
                  EXITFUNC main
                                                                             #109
                  END main, \{-7\}
IR after MIR Lower (flag MIRLower)
                                                                             #68
                = START main
   {-7}
                                                                             #68
                  ENTERFUNC _main
                                                                             #78
   doitagain
               = ASSIGN 1
                                                                             #78
                  GOTO $L2
                                                                             #78
$L3: (1 ref)
                                                                             #78
                = ASSIGN doitagain
   t109
                                                                             #78
                = ADD t109, 1
   t110
                                                                             #78
   doitagain = ASSIGN t110
                                                                             #78
                  GOTO $L2
                                                                             #78
$L2: (2 refs)
                                                                             #78
                = CMP(LE) doitagain, 6000(0x00001770)
   t111
                                                                             #78
                  CBRANCH(LE) t111, $L5, $L4
                                                                             #78
$L5: (1 ref)
                                                                             #80
                = ASSIGN 0
   _i
                                                                             #81
                  GOTO $L6
                                                                             #81
$L6: (2 refs)
                                                                             #81
                = CMP(LE) i, 16(0x00000010)
   t112
                                                                             #81
                  CBRANCH(\overline{LE}) t112, $L8, $L7
                                                                             #81
$L8: (1 ref)
```

```
#83
               = CMP(GE) i, 1
   t113
                 CBRANCH(\overline{GE}) t113, $L10, $L9
                                                                            #83
                                                                            #83
$L10: (1 ref)
                                                                            #83
               = CMP(LE) i, 8
                 CBRANCH(\overline{L}E) t114, $L11, $L9
                                                                             #83
                                                                             #83
$L11: (1 ref)
                                                                             #83
               = MUL i, 4
   t116
                                                                             #83
               = ADD \overline{\&} a, t116
   t117
                                                                             #83
               = ASSIGN t117
   t.118
                                                                             #83
   [t118]
               = ASSIGN 1
                                                                             #83
                 GOTO $L9
                                                                             #83
$L9: (3 refs)
                                                                            #84
               = CMP(GE) i, 2
   t119
                 CBRANCH(\overline{GE}) t119, $L13, $L12
                                                                             #84
                                                                             #84
$L13: (1 ref)
                                                                             #84
               = MUL i, 4
   t121
                                                                             #84
               = ADD \overline{\&} b, t121
   t122
               = ASSIGN t122
                                                                             #84
   t123
                                                                             #84
   [t123]
               = ASSIGN 1
                                                                             #84
                  GOTO $L12
                                                                             #84
$L12: (2 refs)
                                                                             #85
                = CMP(LE) i, 14(0x0000000e)
   t124
                                                                             #85
                 CBRANCH(\overline{LE}) t124, $L15, $L14
                                                                             #85
$L15: (1 ref)
                                                                             #85
               = MUL i, 4
   t126
                                                                             #85
               = ADD & c, t126
   t127
                                                                             #85
   t128
                = ASSIGN t127
                                                                             #85
   [t128]
                = ASSIGN 1
                                                                             #85
                  GOTO $L14
                                                                             #85
$L14: (2 refs)
                                                                             #86
               = ADD i, 1
   t129
                                                                             #86
                = ASSIGN t129
   _i
                                                                             #87
                  GOTO $L6
                                                                             #81
$L7: (1 ref)
                = CALL try, 1, &_q, &_b, &_a, {-5} [Handler: $L1]
                                                                             #89
   \{-5\}
                                                                             #90
                = CMP(EQ) q, 1
   t131
                  CBRANCH(EQ) t131, $L17, $L16
                                                                             #90
                                                                             #90
$L17: (1 ref)
                                                                             #91
                = ASSIGN 1
                                                                             #92
                  GOTO $L18
                                                                             #92
$L18: (2 refs)
                                                                             #92
                = CMP(LE) i, 8
   t132
                                                                             #92
                  CBRANCH(\overline{LE}) t132, $L20, $L19
                                                                             #92
$L20: (1 ref)
                                                                             #93
   t133
                = ADD i, 1
                                                                             #93
                = ASSIGN t133
                                                                             #93
                  GOTO $L18
                                                                             #92
$L19: (1 ref)
                                                                             #95
                GOTO $L21
                                                                             #90
$L16: (1 ref)
                = CALL printf, &$SG1197, {-5} [Handler: $L1]
                                                                            #97
   {-5}
                                                                            #98
                = CALL _exit, 0, {-5} [Handler: $L1]
   \{-5\}
                  GOTO $L21
                                                                             #95
```

```
#95
$L21: (2 refs)
                                                                              #100
                  GOTO $L3
                                                                              #78
$L4: (1 ref)
                = CALL printf, &$SG1198, {-5} [Handler: $L1]
                                                                              #101
   \{-5\}
                  RETURN 0
                                                                              #108
                                                                              #108
                  GOTO $L22
                                                                              #68
      (4 refs)
$L1:
                                                                              #68
                  UNWIND main
                                                                              #108
$L22: (1 ref)
                                                                              #109
                  EXITFUNC main
                                                                              #109
                  END main, \{-7\}
IR after Ssa Construction and Optimization (flag Ssa)
==== Block 1 Pred() Succ(2) next 2 pre 1 post 58 iDom 1 df
                                                                              #68
   \{-7\}, \{-1\} = START main
==== Block 2 Pred(1) Succ(4) prev 1 next 4 pre 2 post 57 iDom 1 df
                                                                               #68
                  ENTERFUNC main
                                                                               #78
   doitagain<*1> = ASSIGN 1
                                                                               #78
                  GOTO $L2
==== Block 4 Pred(3,2) Succ(25,5) prev 2 next 5 pre 3 post 56 iDom 2 df 4
                                                                               #78
$L2: (2 refs)
    _doitagain<*2> = PHI _doitagain<3>, _doitagain<1>
                                                                               #109
                                                                               #78
   \overline{\text{tv}}111-<*6> = CMP(LE) _doitagain<2>, 6000(0x00001770)
                                                                               #78
                  CBRANCH(LE) tv111-<6>, $L5, $L4
==== Block 5 Pred(4) Succ(6) prev 4 next 6 pre 14 post 55 iDom 4 df 4,27
                                                                               #78
$L5: (1 ref)
                                                                               #80
   _i<*7>
                = ASSIGN 0
                                                                               #81
                  GOTO $L6
==== Block 6 Pred(14,5) Succ(15,7) prev 5 next 7 pre 15 post 54 iDom 5 df 4,
6,27
                                                                               #81
$L6:
     (2 refs)
                                                                               #109
    i<*8>
               = PHI i<12>, i<7>
                                                                               #81
   tv112 - (*13) = CMP(LE) i < 8 > 16(0x00000010)
                  CBRANCH(LE) tv112-<13>, $L8, $L7
==== Block 7 Pred(6) Succ(10,8) prev 6 next 8 pre 38 post 53 iDom 6 df 6
                                                                               #81
$L8: (1 ref)
   tv113 - <*14> = CMP(GE) i<8>, 1
                                                                               #83
                  CBRANCH (\overline{GE}) tv113-<14>, $L10, $L9
                                                                               #83
==== Block 8 Pred(7) Succ(10,9) prev 7 next 9 pre 49 post 52 iDom 7 df 10
                                                                               #83
$L10: (1 ref)
                                                                               #83
   tv114 - \langle *15 \rangle = CMP(LE) i \langle 8 \rangle, 8
                                                                               #83
                  CBRANCH(LE) tv114-<15>, $L11, $L9
==== Block 9 Pred(8) Succ(10) prev 8 next 10 pre 50 post 51 iDom 8 df 10
                                                                               #83
       (1 ref)
   tv116 - <*16> = MUL i < 8>, 4
                                                                               #83
                                                                               #83
   tv117 - \langle *17 \rangle = ADD \& a, tv116 - \langle 16 \rangle
                                                                               #83
   [tv117-<17>] = ASSIGN 1
                                                                               #83
                  GOTO $L9
==== Block 10 Pred(9,8,7) Succ(12,11) prev 9 next 11 pre 39 post 48 iDom 7 d
f 6
```

```
#83
$L9: (3 refs)
                                                                                  #84
   tv119 - \langle *18 \rangle = CMP(GE) i \langle 8 \rangle, 2
                   CBRANCH (GE) tv119-<18>, $L13, $L12
                                                                                  #84
==== Block 11 Pred(10) Succ(12) prev 10 next 12 pre 46 post 47 iDom 10 df 12
$L13: (1 ref)
                                                                                  #84
   tv121 - \langle *19 \rangle = MUL i \langle 8 \rangle, 4
                                                                                  #84
   tv122 - \langle *20 \rangle = ADD \& b, tv121 - \langle 19 \rangle
                                                                                  #84
   [tv122-<20>] = ASSIGN 1
                                                                                  #84
                   GOTO $L12
==== Block 12 Pred(11,10) Succ(14,13) prev 11 next 13 pre 40 post 45 iDom 10
df 6
                                                                                  #84
$L12: (2 refs)
   tv124-<*21> = CMP(LE) _i<8>, 14(0x0000000e)
                                                                                  #85
                   CBRANCH(LE) tv124-<21>, $L15, $L14
                                                                                  #85
==== Block 13 Pred(12) Succ(14) prev 12 next 14 pre 43 post 44 iDom 12 df 14
       (1 ref)
                                                                                  #85
   tv126-<*22> = MUL i<8>, 4
                                                                                  #85
   tv127 - \langle *23 \rangle = ADD \& c, tv126 - \langle 22 \rangle
                                                                                  #85
   [tv127-<23>] = ASSIGN 1
                                                                                  #85
                   GOTO $L14
==== Block 14 Pred(13,12) Succ(6) prev 13 next 15 pre 41 post 42 iDom 12 df
                                                                                  #85
$L14: (2 refs)
                                                                                  #86
   tv129 - < *24 > = ADD i < 8 > , 1
                                                                                  #86
                = ASSIGN tv129 - < 24 >
                                                                                  #87
                   GOTO $L6
==== Block 15 Pred(6) Succ(16,27) prev 14 next 16 pre 16 post 37 iDom 6 df 4
,27
                                                                                  #81
$L7: (1 ref)
                                                                                  #89
                 = CALL try, 1, & q, & b, & a, {-5} [Handler: $L1]
   {-5}
                                                                                   #109
                   GOTO $L23
==== Block 16 Pred(15) Succ(21,17) prev 15 next 17 pre 17 post 36 iDom 15 df
 4,27
                                                                                   #109
$L23:
       (1 ref)
                                                                                   #90
   tv131 - \langle *25 \rangle = CMP(EQ) q, 1
                                                                                   #90
                   CBRANCH(EQ) tv131-<25>, $L17, $L16
==== Block 17 Pred(16) Succ(18) prev 16 next 18 pre 28 post 35 iDom 16 df 24
$L17: (1 ref)
                                                                                   #91
   _i<*9>
                 = ASSIGN 1
                                                                                   #92
                   GOTO $L18
==== Block 18 Pred(19,17) Succ(20,19) prev 17 next 19 pre 29 post 34 iDom 17
 df 18,24
                                                                                   #92
$L18: (2 refs)
                                                                                   #109
             = PHI i<11>, i<9>
    i<*10>
                                                                                   #92
   \overline{t}v132 - \langle *26 \rangle = CMP(\overline{LE}) \quad i < 10 \rangle, 8
                    CBRANCH(\overline{LE}) tv132-<26>, $L20, $L19
==== Block 19 Pred(18) Succ(18) prev 18 next 20 pre 32 post 33 iDom 18 df 18
                                                                                   #92
$L20: (1 ref)
                                                                                   #93
   tv133-<*27> = ADD i<10>, 1
                                                                                   #93
    i<*11>
                 = ASSIGN tv133-<27>
                                                                                   #93
                    GOTO $L18
==== Block 20 Pred(18) Succ(24) prev 19 next 21 pre 30 post 31 iDom 18 df 24
                                                                                   #92
$L19: (1 ref)
```

```
GOTO $L21
==== Block 21 Pred(16) Succ(22,27) prev 20 next 22 pre 18 post 27 iDom 16 df
24,27
                                                                          #90
$L16: (1 ref)
                                                                          #97
               = CALL printf, &$SG1197, {-5} [Handler: $L1]
   {-5}
                                                                          #109
                 GOTO $L24
==== Block 22 Pred(21) Succ(23,27) prev 21 next 23 pre 19 post 26 iDom 21 df
 24,27
$L24: (1 ref)
               = CALL exit, 0, \{-5\} [Handler: $L1]
                                                                          #98
   \{-5\}
                                                                          #109
                 GOTO $L25
==== Block 23 Pred(22) Succ(24) prev 22 next 24 pre 20 post 25 iDom 22 df 24
$L25: (1 ref)
                                                                          #95
                 GOTO $L21
==== Block 24 Pred(23,20) Succ(3) prev 23 next 3 pre 21 post 24 iDom 16 df 4
                                                                          #95
$L21: (2 refs)
                                                                          #100
                 GOTO $L3
==== Block 3 Pred(24) Succ(4) prev 24 next 25 pre 22 post 23 iDom 24 df 4
                                                                          #78
$L3: (1 ref)
   tv109 - <*4> = ASSIGN doitagain <2>
                                                                          #78
                                                                          #78
   tv110-<*5> = ADD tv109-<4>, 1
   doitagain<*3> = ASSIGN tv110-<5>
                                                                           #78
                                                                           #78
                 GOTO $L2
==== Block 25 Pred(4) Succ(26,27) prev 3 next 27 pre 4 post 13 iDom 4 df 27,
                                                                          #78
$L4: (1 ref)
               = CALL printf, &$SG1198, {-5} [Handler: $L1]
                                                                          #101
   {-5}
                 GOTO $L26
                                                                           #109
==== Block 27 Pred(25,22,21,15) Succ(29) prev 25 next 26 pre 11 post 12 iDom
 4 df 29
                                                                           #68
$L1: (4 refs)
                                                                           #68
                 UNWIND main
==== Block 26 Pred(25) Succ(28) prev 27 next 28 pre 5 post 10 iDom 25 df 29
                                                                           #109
$L26: (1 ref)
                 RETURN 0
                                                                           #108
                                                                           #108
                 GOTO $L22
==== Block 28 Pred(26) Succ(29) prev 26 next 29 pre 6 post 9 iDom 26 df 29
                                                                           #108
$L22: (1 ref)
                                                                           #109
                 EXITFUNC main
==== Block 29 Pred(28,27) Succ() prev 28 pre 7 post 8 iDom 4 df
                                                                           #109
                 END main, \{-7\}
IR after Ssa Info Destruction (flag Ssa)
   \{-7\}
                                                                           #68
               = START main
                                                                           #68
                 ENTERFUNC main
                                                                           #78
   doitagain<*1> = ASSIGN \overline{1}
                                                                           #78
                 GOTO $L2
                                                                           #78
$L3: (1 ref)
               = ASSIGN doitagain
                                                                           #78
   t109
                                                                           #78
   t110
               = ADD t109, 1
                                                                           #78
   doitagain<*3> = ASSIGN t110
```

```
#78
                 GOTO $L2
                                                                             #78
$L2: (2 refs)
                                                                             #78
               = CMP(LE) doitagain, 6000(0x00001770)
   t111
                                                                             #78
                 CBRANCH(LE) t111, $L5, $L4
                                                                             #78
$L5: (1 ref)
                                                                             #80
   i<*7>
               = ASSIGN 0
                                                                             #81
                 GOTO $L6
                                                                             #81
$L6: (2 refs)
                                                                             #81
               = CMP(LE) i, 16(0x00000010)
   t112
                                                                             #81
                  CBRANCH(\overline{LE}) t112, $L8, $L7
                                                                             #81
$L8: (1 ref)
                                                                             #83
               = CMP(GE) i, 1
   t113
                 CBRANCH(GE) t113, $L10, $L9
                                                                             #83
                                                                             #83
$L10: (1 ref)
                                                                             #83
                = CMP(LE) i, 8
   t114
                                                                             #83
                 CBRANCH(LE) t114, $L11, $L9
                                                                             #83
$L11: (1 ref)
                                                                             #83
                = MUL _i, 4
   t116
                                                                             #83
                = ADD \overline{\&} a, t116
   t117
                                                                             #83
   [t117]
                = ASSIGN 1
                                                                             #83
                  GOTO $L9
                                                                             #83
$L9: (3 refs)
                                                                             #84
                = CMP(GE) i, 2
   t119
                  CBRANCH(GE) t119, $L13, $L12
                                                                             #84
                                                                             #84
$L13: (1 ref)
                = MUL _i, 4
                                                                             #84
   t121
                                                                             #84
                = ADD & b, t121
   t122
                                                                             #84
                = ASSIGN 1
   [t122]
                                                                             #84
                  GOTO $L12
                                                                             #84
$L12: (2 refs)
                                                                             #85
                = CMP(LE) i, 14(0x0000000e)
   t124
                                                                             #85
                  CBRANCH(LE) t124, $L15, $L14
                                                                             #85
$L15: (1 ref)
                                                                             #85
                = MUL i, 4
   t126
                                                                             #85
                = ADD \overline{\&} c, t126
   t127
                                                                             #85
                = ASSIG\overline{N} 1
   [t127]
                                                                             #85
                  GOTO $L14
                                                                             #85
$L14: (2 refs)
                                                                             #86
   t.129
                = ADD i, 1
                                                                             #86
                = ASSIGN t129
   i<*12>
                                                                             #87
                  GOTO $L6
                                                                             #81
$L7: (1 ref)
                = CALL try, 1, &_q, &_b, &_a, {-5} [Handler: $L1]
                                                                             #89
   {-5}
                                                                             #109
                  GOTO $L23
                                                                             #109
$L23: (1 ref)
                                                                              #90
                = CMP(EQ) q, 1
   t131
                                                                              #90
                  CBRANCH(\overline{EQ}) t131, $L17, $L16
                                                                              #90
$L17: (1 ref)
                                                                              #91
   i<*9>
                = ASSIGN 1
                                                                              #92
                  GOTO $L18
                                                                              #92
$L18: (2 refs)
                                                                              #92
                = CMP(LE) i, 8
   t132
                                                                              #92
                  CBRANCH(LE) t132, $L20, $L19
                                      Page 40
```

```
#92
$L20: (1 ref)
                                                                           #93
               = ADD i, 1
  t133
                                                                           #93
   i<*11>
               = ASSIGN t133
                                                                           #93
                 GOTO $L18
                                                                           #92
$L19: (1 ref)
                                                                           #95
                 GOTO $L21
                                                                           #90
$L16: (1 ref)
               = CALL _printf, &$SG1197, {-5} [Handler: $L1]
                                                                           #97
   \{-5\}
                                                                           #109
                 GOTO $L24
                                                                           #109
$L24: (1 ref)
                                                                           #98
               = CALL exit, 0, \{-5\} [Handler: $L1]
   {-5}
                                                                           #109
                 GOTO $L25
                                                                           #109
$L25:
      (1 ref)
                                                                           #95
                 GOTO $L21
                                                                           #95
$L21: (2 refs)
                                                                           #100
                 GOTO $L3
                                                                           #78
$L4: (1 ref)
                                                                           #101
               = CALL printf, &$SG1198, {-5} [Handler: $L1]
   \{-5\}
                                                                           #109
                 GOTO $L26
                                                                           #109
$L26: (1 ref)
                                                                           #108
                 RETURN 0
                                                                           #108
                 GOTO $L22
                                                                           #68
$L1: (4 refs)
                                                                           #68
                 UNWIND main
                                                                           #108
$L22: (1 ref)
                                                                           #109
                 EXITFUNC main
                                                                           #109
                 END main, \{-7\}
IR after Lower (flag Lower)
                                                                            #68
               = START main
   \{-7\}
                                                                            #68
                 ENTERFUNC main
                                                                            #68
                 PROLOGEND
                                                                            #78
   doitagain[_FP] = mov 1
                                                                            #78
                  jmp $L2
                                                                            #78
$L3: (1 ref)
                                                                            #78
             = mov doitagain[ FP]
   t109( rd)
                                                                            #78
   tv110-(_rd) = mov \overline{t}109(rd)
   tv110-(_rd)<*5>, EFLAGS = add tv110-(_rd), 1
                                                                            #78
   doitagain[ FP] = mov tv110-( rd)
                                                                            #78
                                                                            #78
                  jmp $L2
                                                                            #78
$L2: (2 refs)
                                                                            #78
   t111(EFLAGS) = cmp(LE) doitagain[_FP], 6000(0x00001770)
                                                                            #78
                  jcc(LE) t111(EFLAGS), $L5, $L4
                                                                            #78
$L5: (1 ref)
                                                                            #80
   _i[_FP]
                = mov 0
                                                                            #81
                  jmp $L6
                                                                            #81
$L6: (2 refs)
                                                                            #81
   t112(EFLAGS) = cmp(LE) i[FP], 16(0x00000010)
                                                                            #81
                  jcc(LE) t112(EFLAGS), $L8, $L7
                                                                            #81
$L8: (1 ref)
                                                                            #83
   t113(EFLAGS) = cmp(GE) i[FP], 1
                                     Page 41
```

```
AppendixF.txt
                                                                         #83
                 jcc(GE) t113(EFLAGS), $L10, $L9
                                                                         #83
$L10: (1 ref)
                                                                         #83
   t114(EFLAGS) = cmp(LE) i[ FP], 8
                 jcc(LE) t114(EFLAGS), $L11, $L9
                                                                         #83
                                                                         #83
$L11: (1 ref)
                                                                         #83
   t116(rd), EFLAGS = imul i[FP], 4
   tv117-(rd) = mov t116(rd)
                                                                         #83
   tv117-(-rd)<*17>, EFLAGS = add tv117-(-rd), & a
                                                                         #83
                                                                         #83
   [tv117-(_rd)] = mov 1
                                                                          #83
                 jmp $L9
                                                                         #83
$L9: (3 refs)
                                                                         #84
   t119(EFLAGS) = cmp(GE) i[FP], 2
                                                                         #84
                 jcc(GE) t119(EFLAGS), $L13, $L12
                                                                         #84
$L13: (1 ref)
                                                                         #84
   t121(rd), EFLAGS = imul i[FP], 4
                                                                          #84
   tv122-(rd) = mov t121(rd)
   tv122-(-rd)<*20>, EFLAGS = add tv122-(rd), & b
                                                                          #84
                                                                          #84
   [tv122-(rd)] = mov 1
                 jmp $L12
                                                                          #84
                                                                          #84
$L12: (2 refs)
                                                                          #85
   t124(EFLAGS) = cmp(LE) i [FP], 14(0x0000000e)
                                                                          #85
                 jcc(LE) t124(EFLAGS), $L15, $L14
                                                                          #85
$L15: (1 ref)
   t126(rd), EFLAGS = imul i[FP], 4
                                                                          #85
                                                                          #85
   tv127-(rd) = mov t126(rd)
                                                                          #85
   tv127-(rd)<*23>, EFLAGS = add tv127-(rd), &_c
                                                                          #85
   [tv127-(_rd)] = mov 1
                                                                          #85
                 jmp $L14
                                                                          #85
$L14: (2 refs)
                                                                          #86
   tv129-(rd) = mov 1
   tv129-(rd)<*24>, EFLAGS = add tv129-(rd), i[FP]
                                                                          #86
                                                                          #86
   i[FP] = mov tv129-(rd)
                                                                          #87
                 jmp $L6
                                                                          #81
$L7: (1 ref)
   [ESP], \{ESP\} = push & a, \{ESP\}
                                                                          #89
                                                                          #89
   [ESP], \{ESP\} = push & b, \{ESP\}
                                                                          #89
             = lea \&_q[_FP]
   t140( rd)
                                                                          #89
   [ESP], \{ESP\} = push t140( rd), \{ESP\}
                                                                          #89
   [ESP], \{ESP\} = push 1, \{ESP\}
   {-5}, {EAX ECX ESP EFLAGS} = call try, $out[ESP], $out[ESP]+32, $out[ESP]
]+64, $out[ESP]+96, {-5}, {EAX ECX ESP EFLAGS} [Handler: $L1]
#89
                                                                          #89
   ESP, EFLAGS = add ESP, 16(0\times00000010)
                                                                          #109
                 jmp $L23
                                                                          #109
$L23: (1 ref)
                                                                          #90
   t131(EFLAGS) = cmp(EQ) q[FP], 1
                                                                          #90
                 jcc(EQ) t131(EFLAGS), $L17, $L16
                                                                          #90
$L17: (1 ref)
                                                                          #91
   i[ FP]
               = mov 1
                                                                          #92
                 jmp $L18
                                                                          #92
$L18: (2 refs)
                                                                          #92
   t132(EFLAGS) = cmp(LE) i[FP], 8
                                                                          #92
                 jcc(LE) t132(EFLAGS), $L20, $L19
                                    Page 42
```

```
#92
$L20: (1 ref)
                                                                           #93
   tv133-(rd) = mov 1
   tv133-(rd)<*27>, EFLAGS = add tv133-(rd), i[FP]
                                                                           #93
               = mov tv133-( rd)
                                                                           #93
                                                                           #93
                  jmp $L18
                                                                           #92
$L19:
      (1 ref)
                                                                           #95
                 jmp $L21
                                                                           #90
$L16: (1 ref)
   [ESP], \{ESP\} = push &$SG1197, \{ESP\}
                                                                           #97
   {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7 FPUStatus} = call
  printf, $out[ESP], {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7
 FPUStatus | [Handler: $L1]
    #97
                                                                           #97
   ESP, EFLAGS = add ESP, 4
                                                                           #109
                  jmp $L24
                                                                           #109
$L24: (1 ref)
   [ESP], \{ESP\} = push 0, \{ESP\}
   {-5}, {EAX ECX EDX ESP EFLAGS MMO-MM7 XMMO-XMM7 FPO-FP7 FPUStatus} = call
  exit, $out[ESP], {-5}, {EAX ECX EDX ESP EFLAGS MMO-MM7 XMMO-XMM7 FPO-FP7 F
PUStatus [Handler: $L1]
    #98
                                                                           #98
   ESP, EFLAGS = add ESP, 4
                  jmp $L25
                                                                           #109
$L25:
                                                                           #109
      (1 ref)
                                                                           #95
                  jmp $L21
                                                                           #95
$L21:
       (2 refs)
                                                                           #100
                  jmp $L3
                                                                           #78
$L4: (1 ref)
   [ESP], \{ESP\} = push &$SG1198, \{ESP\}
                                                                           #101
   {-5}, {EAX ECX EDX ESP EFLAGS MMO-MM7 XMMO-XMM7 FPO-FP7 FPUStatus} = call
  printf, $out[ESP], {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7
 FPUStatus | [Handler: $L1]
    #101
                                                                            #101
   ESP, EFLAGS = add ESP, 4
                  jmp $L26
                                                                            #109
                                                                            #109
$L26: (1 ref)
                                                                            #108
   t142 (EAX)
               = mov 0
                                                                            #108
                  jmp $L22
                                                                            #68
$L1:
      (4 refs)
                                                                            #68
                 UNWIND main
$L22: (1 ref)
                                                                            #108
                                                                            #109
                  EPILOGSTART
                                                                            #109
                  EXITFUNC main, t142(EAX)
                                                                            #109
                  END main, \{-7\}
IR after Linear Scan Register Allocation (flag LinearScan)
                                                                            #68
   \{-7\}
               = START main
                  ENTERFUNC main
                                                                            #68
                                                                            #68
                  PROLOGEND
                                                                            #78
   doitagain[ FP] = mov 1
                                                                            #78
                  jmp $L2
```

```
#78
$L3: (1 ref)
                                                                         #78
  t109(EAX) = mov doitagain[FP]
                                                                         #78
  tv110-(EAX) = mov t109(EAX)
                                                                         #78
  tv110-(EAX)<*5>, EFLAGS = add tv110-(EAX), 1
                                                                         #78
  doitagain[ FP] = mov tv110-(EAX)
                                                                         #78
                 jmp $L2
                                                                         #78
$L2: (2 refs)
   t111(EFLAGS) = cmp(LE) doitagain[FP], 6000(0x00001770)
                                                                         #78
                                                                         #78
                 jcc(LE) t111(EFLAGS), $L5, $L4
                                                                         #78
$L5: (1 ref)
                                                                         #80
               = mov 0
   i[ FP]
                                                                         #81
                 jmp $L6
                                                                         #81
$L6: (2 refs)
                                                                         #81
   t112(EFLAGS) = cmp(LE) i[FP], 16(0x00000010)
                                                                         #81
                 jcc(LE) t112(EFLAGS), $L8, $L7
                                                                         #81
$L8: (1 ref)
                                                                         #83
   t113(EFLAGS) = cmp(GE) i[FP], 1
                 jcc(GE) t113(EFLAGS), $L10, $L9
                                                                          #83
                                                                          #83
$L10: (1 ref)
                                                                          #83
   t114(EFLAGS) = cmp(LE) i[FP], 8
                                                                         #83
                jcc(LE) t114(EFLAGS), $L11, $L9
                                                                          #83
$L11: (1 ref)
                                                                          #83
   t116(EAX), EFLAGS = imul i[_FP], 4
                                                                          #83
   tv117-(EAX) = mov t116(EAX)
                                                                          #83
   tv117-(EAX)<*17>, EFLAGS = add tv117-(EAX), &_a
                                                                          #83
   [tv117-(EAX)] = mov 1
                                                                          #83
                 jmp $L9
                                                                          #83
$L9: (3 refs)
                                                                          #84
   t119(EFLAGS) = cmp(GE) i[FP], 2
                                                                          #84
                 jcc(GE) t119(EFLAGS), $L13, $L12
                                                                          #84
$L13: (1 ref)
                                                                          #84
   t121(EAX), EFLAGS = imul _i[ FP], 4
                                                                          #84
   tv122-(EAX) = mov t121(EAX)
                                                                          #84
   tv122-(EAX)<*20>, EFLAGS = add tv122-(EAX), & b
                                                                          #84
   [tv122-(EAX)] = mov 1
                                                                          #84
                 jmp $L12
                                                                          #84
$L12: (2 refs)
                                                                          #85
   t124(EFLAGS) = cmp(LE) i [FP], 14(0x0000000e)
                                                                          #85
                 jcc(LE) t124(EFLAGS), $L15, $L14
                                                                          #85
$L15: (1 ref)
                                                                          #85
   t126(EAX), EFLAGS = imul i[FP], 4
                                                                          #85
   tv127-(EAX) = mov t126(EAX)
   tv127-(EAX)<*23>, EFLAGS = add tv127-(EAX), & c
                                                                          #85
                                                                          #85
   [tv127-(EAX)] = mov 1
                                                                          #85
                 jmp $L14
                                                                          #85
$L14: (2 refs)
                                                                          #86
   tv129-(EAX) = mov 1
                                                                          #86
   tv129-(EAX)<*24>, EFLAGS = add tv129-(EAX), i[FP]
                                                                          #86
               = mov tv129-(EAX)
   i[ FP]
                                                                          #87
                 jmp $L6
                                                                          #81
$L7: (1 ref)
                                                                          #89
   [ESP], \{ESP\} = push &_a, \{ESP\}
                                                                          #89
   [ESP], \{ESP\} = push & b, \{ESP\}
```

```
#89
             = lea & q[ FP]
  t140 (EAX)
                                                                             #89
   [ESP], {ESP} = push t1\overline{40} (EAX), {ESP}
   [ESP], \{ESP\} = push 1, \{ESP\}
                                                                             #89
   {-5}, {EAX ECX ESP EFLAGS} = call try, $out[ESP], $out[ESP]+32, $out[ESP]
]+64, $out[ESP]+96, {-5}, {EAX ECX ESP EFLAGS} [Handler: $L1]
#89
                                                                             #109
                  imp $L27
                                                                             #109
$L27: (1 ref)
                                                                             #89
   ESP, EFLAGS = add ESP, 16(0\times00000010)
                                                                             #109
                  jmp $L23
                                                                             #109
$L23: (1 ref)
   t131(EFLAGS) = cmp(EQ) _q[_FP], 1
                                                                             #90
                                                                             #90
                 jcc(EQ) t\overline{131}(EFLAGS), $L17, $L16
                                                                             #90
$L17: (1 ref)
                                                                             #91
   i[ FP]
               = mov 1
                                                                             #92
                  jmp $L18
                                                                             #92
$L18: (2 refs)
                                                                             #92
   t132(EFLAGS) = cmp(LE) i[FP], 8
                  jcc(LE) t132(EFLAGS), $L20, $L19
                                                                             #92
                                                                             #92
$L20: (1 ref)
                                                                             #93
   tv133-(EAX) = mov 1
                                                                             #93
   tv133-(EAX)<*27>, EFLAGS = add tv133-(EAX), i[FP]
                                                                             #93
              = mov tv133-(EAX)
                  jmp $L18
                                                                             #93
                                                                             #92
$L19:
      (1 ref)
                                                                             #95
                  jmp $L21
                                                                             #90
$L16: (1 ref)
   [ESP], \{ESP\} = push \&\$SG1197, \{ESP\}
   {-5}, {EAX ECX EDX ESP EFLAGS MMO-MM7 XMMO-XMM7 FPO-FP7 FPUStatus} = call
 printf, $out[ESP], {-5}, {EAX ECX EDX ESP EFLAGS MMO-MM7 XMMO-XMM7 FPO-FP7
FPUStatus | [Handler: $L1]
    #97
                                                                             #109
                  jmp $L28
                                                                             #109
$L28: (1 ref)
   ESP, EFLAGS = add ESP, 4
                                                                             #97
                                                                             #109
                  jmp $L24
                                                                             #109
$L24: (1 ref)
   [ESP], \{ESP\} = push 0, \{ESP\}
                                                                             #98
   {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7 FPUStatus} = call
  exit, $out[ESP], {-5}, {EAX ECX EDX ESP EFLAGS MMO-MM7 XMMO-XMM7 FPO-FP7 F
PUStatus | [Handler: $L1]
    #98
                                                                             #109
                  jmp $L29
                                                                             #109
$L29: (1 ref)
                                                                             #98
   ESP, EFLAGS = add ESP, 4
                                                                             #109
                  jmp $L25
                                                                             #109
$L25:
      (1 ref)
                                                                             #95
                  jmp $L21
                                                                             #95
$L21:
      (2 refs)
                                                                             #100
                  jmp $L3
                                                                             #78
$L4: (1 ref)
                                                                             #101
   [ESP], \{ESP\} = push \&\$SG1198, \{ESP\}
   {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7 FPUStatus} = call
                                     Page 45
```

```
printf, $out[ESP], {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7
FPUStatus [Handler: $L1]
    #101
                                                                           #109
                 jmp $L30
                                                                           #109
$L30: (1 ref)
                                                                           #101
   ESP, EFLAGS = add ESP, 4
                                                                           #109
                 jmp $L26
                                                                           #109
$L26: (1 ref)
                                                                           #108
               = mov 0
   t142 (EAX)
                                                                           #108
                 jmp $L22
                                                                           #68
$L1: (4 refs)
                                                                           #68
                 UNWIND main
                                                                           #108
$L22: (1 ref)
                                                                           #109
                 EPILOGSTART
                                                                           #109
                 EXITFUNC main, t142(EAX)
                                                                           #109
                 END main, \{-7\}
IR after Stack Allocation (flag StackAlloc)
                                                                           #68
   \{-7\}
               = START main
                                                                           #68
                 ENTERFUNC _main
                                                                           #68
                 PROLOGEND
                                                                           #78
   doitagain[_FP] = mov 1
                                                                           #78
                  jmp $L2
                                                                           #78
$L3: (1 ref)
                                                                           #78
               = mov doitagain[_FP]
   t109(EAX)
                                                                           #78
   tv110-(EAX) = mov t109(EAX)
                                                                           #78
   tv110-(EAX)<*5>, EFLAGS = add tv110-(EAX), 1
                                                                           #78
   doitagain[ FP] = mov tv110-(EAX)
                                                                           #78
                  jmp $L2
                                                                           #78
$L2: (2 refs)
                                                                           #78
   t111(EFLAGS) = cmp(LE) doitagain[FP], 6000(0x00001770)
                                                                           #78
                  jcc(LE) t111(EFLAGS), $L5, $L4
                                                                           #78
$L5: (1 ref)
                                                                           #80
               = mov 0
   _i[_FP]
                                                                           #81
                  jmp $L6
                                                                           #81
$L6: (2 refs)
                                                                           #81
   t112(EFLAGS) = cmp(LE) i[FP], 16(0x00000010)
                                                                           #81
                  jcc(LE) t112(EFLAGS), $L8, $L7
                                                                           #81
$L8: (1 ref)
                                                                           #83
   t113(EFLAGS) = cmp(GE) i[FP], 1
                                                                           #83
                  jcc(GE) t113 (EFLAGS), $L10, $L9
                                                                           #83
$L10: (1 ref)
                                                                           #83
   t114(EFLAGS) = cmp(LE) i[FP], 8
                                                                           #83
                  jcc(LE) t114(EFLAGS), $L11, $L9
                                                                           #83
$L11: (1 ref)
                                                                           #83
   t116(EAX), EFLAGS = imul i[FP], 4
                                                                           #83
   tv117-(EAX) = mov t116(EA\overline{X})
                                                                           #83
   tv117-(EAX)<*17>, EFLAGS = add tv117-(EAX), & a
                                                                           #83
   [tv117-(EAX)] = mov 1
                                                                           #83
                  jmp $L9
                                                                           #83
$L9: (3 refs)
```

```
#84
  t119(EFLAGS) = cmp(GE) i[FP], 2
                                                                           #84
                 jcc(GE) t119(EFLAGS), $L13, $L12
                                                                           #84
$L13: (1 ref)
                                                                           #84
  t121(EAX), EFLAGS = imul i[FP], 4
                                                                           #84
  tv122-(EAX) = mov t121(EAX)
  tv122-(EAX)<*20>, EFLAGS = add tv122-(EAX), & b
                                                                           #84
                                                                           #84
   [tv122-(EAX)] = mov 1
                                                                           #84
                 jmp $L12
                                                                           #84
$L12: (2 refs)
                                                                           #85
  t124(EFLAGS) = cmp(LE) i[FP], 14(0x0000000e)
                 jcc(LE) t\overline{124}(EFLAGS), $L15, $L14
                                                                           #85
                                                                           #85
$L15: (1 ref)
                                                                           #85
  t126(EAX), EFLAGS = imul i[FP], 4
                                                                           #85
   tv127-(EAX) = mov t126(EAX)
                                                                           #85
  tv127-(EAX)<*23>, EFLAGS = add tv127-(EAX), & c
                                                                           #85
   [tv127-(EAX)] = mov 1
                                                                           #85
                 jmp $L14
                                                                           #85
$L14: (2 refs)
                                                                           #86
   tv129-(EAX) = mov 1
                                                                           #86
   tv129-(EAX)<*24>, EFLAGS = add tv129-(EAX), i[ FP]
                                                                           #86
   _{i[\_FP]} = mov tv129-(EAX)
                                                                           #87
                 jmp $L6
                                                                           #81
$L7: (1 ref)
                                                                           #89
   [ESP], \{ESP\} = push & a, \{ESP\}
                                                                           #89
   [ESP], \{ESP\} = push & b, \{ESP\}
                                                                           #89
   t140(EAX) = lea & q[FP]
                                                                           #89
   [ESP], \{ESP\} = push t140(EAX), \{ESP\}
                                                                           #89
   [ESP], \{ESP\} = push 1, \{ESP\}
   {-5}, {EAX ECX ESP EFLAGS} = call try, $out[ESP], $out[ESP]+32, $out[ESP]
]+64, $out[ESP]+96, {-5}, {EAX ECX ESP EFLAGS} [Handler: $L1]
#89
                                                                           #109
                 jmp $L27
                                                                           #109
$L27: (1 ref)
                                                                           #89
   ESP, EFLAGS = add ESP, 16(0\times00000010)
                                                                           #109
                 jmp $L23
                                                                           #109
$L23: (1 ref)
                                                                           #90
   t131(EFLAGS) = cmp(EQ) q[FP], 1
                                                                           #90
                 jcc(EQ) t131(EFLAGS), $L17, $L16
                                                                           #90
$L17: (1 ref)
                                                                           #91
   _i[_FP]
               = mov 1
                                                                           #92
                 jmp $L18
                                                                           #92
$L18: (2 refs)
                                                                           #92
   t132(EFLAGS) = cmp(LE) i[FP], 8
                                                                           #92
                  jcc(LE) t132(EFLAGS), $L20, $L19
                                                                           #92
$L20: (1 ref)
                                                                           #93
   tv133-(EAX) = mov 1
   tv133-(EAX)<*27>, EFLAGS = add tv133-(EAX), i[ FP]
                                                                           #93
                                                                           #93
               = mov tv133-(EAX)
   i[ FP]
                                                                           #93
                  jmp $L18
                                                                           #92
$L19: (1 ref)
                                                                           #95
                  jmp $L21
                                                                            #90
$L16: (1 ref)
                                                                            #97
   [ESP], \{ESP\} = push \&\$SG1197, \{ESP\}
                                    Page 47
```

```
{-5}, {EAX ECX EDX ESP EFLAGS MMO-MM7 XMMO-XMM7 FPO-FP7 FPUStatus} = call
 printf, $out[ESP], {-5}, {EAX ECX EDX ESP EFLAGS MMO-MM7 XMMO-XMM7 FPO-FP7
FPUStatus [Handler: $L1]
    #97
                                                                            #109
                 jmp $L28
                                                                            #109
$L28: (1 ref)
   ESP, EFLAGS = add ESP, 4
                                                                            #97
                                                                            #109
                 jmp $L24
                                                                            #109
$L24: (1 ref)
   [ESP], \{ESP\} = push 0, \{ESP\}
                                                                            #98
   {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7 FPUStatus} = call
  exit, $out[ESP], {-5}, {EAX ECX EDX ESP EFLAGS MMO-MM7 XMMO-XMM7 FPO-FP7 F
PUStatus [Handler: $L1]
    #98
                                                                            #109
                 jmp $L29
                                                                            #109
$L29: (1 ref)
                                                                            #98
   ESP, EFLAGS = add ESP, 4
                                                                            #109
                 jmp $L25
$L25:
       (1 ref)
                                                                            #109
                                                                            #95
                 jmp $L21
                                                                            #95
$L21:
      (2 refs)
                                                                            #100
                 jmp $L3
                                                                            #78
$L4: (1 ref)
   [ESP], \{ESP\} = push &$SG1198, \{ESP\}
                                                                            #101
   {-5}, {EAX ECX EDX ESP EFLAGS MMO-MM7 XMMO-XMM7 FPO-FP7 FPUStatus} = call
  printf, $out[ESP], {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7
 FPUStatus [Handler: $L1]
    #101
                                                                            #109
                 jmp $L30
                                                                            #109
$L30: (1 ref)
                                                                            #101
   ESP, EFLAGS = add ESP, 4
                                                                            #109
                  jmp $L26
                                                                            #109
$L26: (1 ref)
                                                                            #108
   t142 (EAX)
               = mov 0
                  jmp $L22
                                                                            #108
                                                                            #68
      (4 refs)
$L1:
                                                                            #68
                 UNWIND main
                                                                            #108
$L22: (1 ref)
                                                                            #109
                 EPILOGSTART
                                                                            #109
                 EXITFUNC main, t142(EAX)
                 END main, \{-7\}
                                                                            #109
IR after Frame Generation (flag Frame)
                                                                            #68
               = START main
   \{-7\}
                                                                            #68
                 ENTERFUNC _main
                                                                            #68
   [ESP], \{ESP\} = push EBP, \{ESP\}
                                                                            #68
               = mov ESP
   ESP, EFLAGS = sub ESP, 16(0\times00000010)
                                                                            #68
                                                                            #68
                 PROLOGEND
                                                                            #78
   doitagain[EBP] = mov 1
                                                                            #78
                  jmp $L2
```

```
#78
$L3: (1 ref)
                                                                          #78
   t109(EAX) = mov doitagain[EBP]
   tv110-(EAX) = mov t109(EAX)
                                                                          #78
                                                                          #78
   tv110-(EAX)<*5>, EFLAGS = add tv110-(EAX), 1
   doitagain[EBP] = mov tv110-(EAX)
                                                                          #78
                 jmp $L2
                                                                          #78
                                                                          #78
$L2: (2 refs)
   t111(EFLAGS) = cmp(LE) doitagain[EBP], 6000(0x00001770)
                                                                          #78
                                                                          #78
                 jcc(LE) t111(EFLAGS), $L5, $L4
                                                                          #78
$L5: (1 ref)
                                                                          #80
               = mov 0
   i[EBP]
                                                                          #81
                 jmp $L6
$L6: (2 refs)
                                                                          #81
   t112 (EFLAGS) = cmp(LE) i [EBP], 16 (0x00000010)
                                                                          #81
                                                                          #81
                 jcc(LE) t112(EFLAGS), $L8, $L7
                                                                          #81
$L8: (1 ref)
   t113(EFLAGS) = cmp(GE) i[EBP], 1
                                                                          #83
                 jcc(GE) t113(EFLAGS), $L10, $L9
                                                                          #83
$L10: (1 ref)
                                                                          #83
   t114(EFLAGS) = cmp(LE) i[EBP], 8
                                                                          #83
                 jcc(LE) t114(EFLAGS), $L11, $L9
                                                                          #83
                                                                          #83
$L11: (1 ref)
   t116(EAX), EFLAGS = imul i[EBP], 4
                                                                          #83
                                                                          #83
   tv117-(EAX) = mov t116(EAX)
                                                                          #83
   tv117-(EAX)<*17>, EFLAGS = add tv117-(EAX), & a
                                                                          #83
   [tv117-(EAX)] = mov 1
                                                                          #83
                 jmp $L9
                                                                          #83
$L9: (3 refs)
   t119(EFLAGS) = cmp(GE) i[EBP], 2
                                                                          #84
                                                                          #84
                 jcc(GE) t119(EFLAGS), $L13, $L12
$L13: (1 ref)
                                                                          #84
   t121(EAX), EFLAGS = imul i[EBP], 4
                                                                           #84
                                                                           #84
   tv122-(EAX) = mov t121(EAX)
   tv122-(EAX)<*20>, EFLAGS = add tv122-(EAX), & b
                                                                          #84
                                                                           #84
   [tv122-(EAX)] = mov 1
                                                                           #84
                 jmp $L12
                                                                           #84
$L12: (2 refs)
   t124(EFLAGS) = cmp(LE) i[EBP], 14(0x0000000e)
                                                                           #85
                                                                          #85
                 jcc(LE) t\overline{124}(EFLAGS), $L15, $L14
$L15: (1 ref)
                                                                           #85
   t126(EAX), EFLAGS = imul i[EBP], 4
                                                                           #85
                                                                           #85
   tv127-(EAX) = mov t126(EAX)
                                                                           #85
   tv127-(EAX)<*23>, EFLAGS = add tv127-(EAX), & c
                                                                           #85
   [tv127-(EAX)] = mov 1
                 jmp $L14
                                                                           #85
$L14: (2 refs)
                                                                           #85
                                                                           #86
   tv129-(EAX) = mov 1
   tv129-(EAX)<*24>, EFLAGS = add tv129-(EAX), i[EBP]
                                                                           #86
               = mov tv129-(EAX)
                                                                           #86
   i[EBP]
                 jmp $L6
                                                                           #87
$L7: (1 ref)
                                                                           #81
                                                                           #89
   [ESP], \{ESP\} = push \&_a, \{ESP\}
                                                                           #89
   [ESP], \{ESP\} = push & b, \{ESP\}
```

```
#89
             = lea & q[EBP]
  t140(EAX)
                                                                             #89
   [ESP], \{ESP\} = push t140(EAX), \{ESP\}
                                                                             #89
   [ESP], \{ESP\} = push 1, \{ESP\}
   {-5}, {EAX ECX ESP EFLAGS} = call try, $out[ESP], $out[ESP]+32, $out[ESP]
1+64, \{\text{Sout}[\text{ESP}]+96, \{-5\}, \{\text{EAX ECX ESP EFLAGS}\} [Handler: \{\text{L1}\}]
#89
                                                                             #109
                  jmp $L27
                                                                             #109
$L27: (1 ref)
                                                                             #89
   ESP, EFLAGS = add ESP, 16(0\times00000010)
                                                                             #109
                  jmp $L23
                                                                             #109
$L23: (1 ref)
                                                                             #90
   t131(EFLAGS) = cmp(EQ) q[EBP], 1
                                                                             #90
                  jcc(EQ) t131(EFLAGS), $L17, $L16
                                                                             #90
$L17: (1 ref)
                                                                             #91
                = mov 1
   i[EBP]
                                                                             #92
                  jmp $L18
                                                                             #92
$L18: (2 refs)
                                                                             #92
   t132(EFLAGS) = cmp(LE) i[EBP], 8
                  jcc(LE) t\overline{1}32(EFLAGS), $L20, $L19
                                                                             #92
                                                                             #92
$L20: (1 ref)
                                                                             #93
   tv133-(EAX) = mov 1
                                                                             #93
   tv133-(EAX) < 27>, EFLAGS = add tv133-(EAX), i[EBP]
                                                                             #93
             = mov tv133-(EAX)
                                                                             #93
                  jmp $L18
                                                                              #92
$L19:
      (1 ref)
                                                                              #95
                  jmp $L21
                                                                              #90
$L16: (1 ref)
   [ESP], \{ESP\} = push &$SG1197, \{ESP\}
   {-5}, {EAX ECX EDX ESP EFLAGS MMO-MM7 XMMO-XMM7 FPO-FP7 FPUStatus} = call
  printf, $out[ESP], {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7
 FPUStatus [Handler: $L1]
    #97
                                                                              #109
                  jmp $L28
                                                                              #109
$L28: (1 ref)
                                                                              #97
   ESP, EFLAGS = add ESP, 4
                                                                              #109
                  jmp $L24
                                                                              #109
$L24: (1 ref)
                                                                              #98
   [ESP], \{ESP\} = push 0, \{ESP\}
   {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7 FPUStatus} = call
  exit, $out[ESP], {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7 F
PUStatus [Handler: $L1]
    #98
                                                                              #109
                  jmp $L29
                                                                              #109
$L29: (1 ref)
                                                                              #98
   ESP, EFLAGS = add ESP, 4
                                                                              #109
                  imp $L25
                                                                              #109
$L25:
      (1 ref)
                                                                              #95
                  jmp $L21
                                                                              #95
$L21: (2 refs)
                                                                              #100
                  jmp $L3
                                                                              #78
$L4: (1 ref)
                                                                              #101
   [ESP], \{ESP\} = push &$SG1198, \{ESP\}
   {-5}, {EAX ECX EDX ESP EFLAGS MMO-MM7 XMMO-XMM7 FPO-FP7 FPUStatus} = call
                                     Page 50
```

```
printf, $out[ESP], {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7
FPUStatus [Handler: $L1]
    #101
                                                                           #109
                 jmp $L30
                                                                           #109
$L30: (1 ref)
                                                                           #101
   ESP, EFLAGS = add ESP, 4
                                                                           #109
                 jmp $L26
                                                                           #109
$L26: (1 ref)
                                                                           #108
               = mov 0
   t142(EAX)
                                                                           #108
                 jmp $L22
                                                                           #68
$L1: (4 refs)
                                                                           #68
                 UNWIND main
                                                                           #108
$L22: (1 ref)
                                                                           #109
                 EPILOGSTART
                                                                           #109
               = mov EBP
   ESP
                                                                           #109
               = pop [ESP], {ESP}
   EBP, {ESP}
                                                                           #109
               = ret {ESP}
   {ESP}
                                                                           #109
                 EXITFUNC _main, t142(EAX)
                                                                           #109
                 END main, \{-7\}
IR after Switch Lower (flag SwitchLower)
                                                                            #68
               = START main
   \{-7\}
                                                                            #68
                 ENTERFUNC main
                                                                            #68
   [ESP], \{ESP\} = push EBP, \{ESP\}
                                                                            #68
               = mov ESP
   ESP, EFLAGS = sub ESP, 16(0x00000010)
                                                                            #68
                                                                            #68
                 PROLOGEND
                                                                            #78
   _doitagain[EBP] = mov 1
                                                                            #78
                  jmp $L2
                                                                            #78
$L3: (1 ref)
                                                                            #78
               = mov _doitagain[EBP]
   t109(EAX)
                                                                            #78
   tv110-(EAX) = mov \overline{t}109(EAX)
                                                                            #78
   tv110-(EAX)<*5>, EFLAGS = add tv110-(EAX), 1
   doitagain[EBP] = mov tv110-(EAX)
                                                                            #78
                                                                            #78
                  jmp $L2
                                                                            #78
$L2: (2 refs)
                                                                            #78
   t111(EFLAGS) = cmp(LE) doitagain[EBP], 6000(0x00001770)
                                                                            #78
                  jcc(LE) t111(EFLAGS), $L5, $L4
                                                                            #78
$L5: (1 ref)
                                                                            #80
   i[EBP]
               = mov 0
                                                                            #81
                  jmp $L6
                                                                            #81
$L6: (2 refs)
   t112(EFLAGS) = cmp(LE) i[EBP], 16(0x00000010)
                                                                            #81
                                                                            #81
                  jcc(LE) t112(EFLAGS), $L8, $L7
                                                                            #81
$L8: (1 ref)
                                                                            #83
   t113(EFLAGS) = cmp(GE) i[EBP], 1
                                                                            #83
                  jcc(GE) t113(EFLAGS), $L10, $L9
                                                                            #83
$L10: (1 ref)
                                                                            #83
   t114(EFLAGS) = cmp(LE) i[EBP], 8
                                                                            #83
                  jcc(LE) t114(EFLAGS), $L11, $L9
                                                                            #83
$L11: (1 ref)
```

```
AppendixF.txt
                                                                            #83
   t116(EAX), EFLAGS = imul i[EBP], 4
                                                                            #83
   tv117-(EAX) = mov t116(EAX)
                                                                            #83
   tv117-(EAX)<*17>, EFLAGS = add tv117-(EAX), & a
                                                                            #83
   [tv117-(EAX)] = mov 1
                                                                            #83
                 jmp $L9
                                                                            #83
$L9: (3 refs)
                                                                            #84
   t119(EFLAGS) = cmp(GE) i[EBP], 2
                                                                            #84
                  jcc(GE) t119(EFLAGS), $L13, $L12
                                                                            #84
$L13: (1 ref)
                                                                            #84
   t121(EAX), EFLAGS = imul i[EBP], 4
                                                                            #84
   tv122-(EAX) = mov t121(EAX)
                                                                            #84
   tv122-(EAX)<*20>, EFLAGS = add tv122-(EAX), & b
                                                                            #84
   [tv122-(EAX)] = mov 1
                                                                            #84
                 jmp $L12
                                                                            #84
$L12: (2 refs)
                                                                            #85
   t124(EFLAGS) = cmp(LE) i[EBP], 14(0x0000000e)
                                                                            #85
                  jcc(LE) t124(EFLAGS), $L15, $L14
                                                                            #85
$L15: (1 ref)
                                                                            #85
   t126(EAX), EFLAGS = imul i[EBP], 4
                                                                            #85
   tv127-(EAX) = mov t126(EAX)
                                                                            #85
   tv127-(EAX)<*23>, EFLAGS = add tv127-(EAX), &_C
                                                                            #85
   [tv127-(EAX)] = mov 1
                                                                            #85
                 jmp $L14
                                                                            #85
$L14: (2 refs)
                                                                            #86
   tv129-(EAX) = mov 1
                                                                            #86
   tv129-(EAX)<*24>, EFLAGS = add tv129-(EAX), i[EBP]
                                                                            #86
               = mov tv129-(EAX)
   i[EBP]
                                                                            #87
                  jmp $L6
                                                                            #81
$L7: (1 ref)
                                                                            #89
   [ESP], \{ESP\} = push & a, \{ESP\}
                                                                            #89
   [ESP], \{ESP\} = push & b, \{ESP\}
                                                                            #89
   t140(EAX) = lea & q[EBP]
                                                                            #89
   [ESP], \{ESP\} = push t140(EAX), \{ESP\}
   [ESP], \{ESP\} = push 1, \{ESP\}
                                                                            #89
   {-5}, {EAX ECX ESP EFLAGS} = call try, $out[ESP], $out[ESP]+32, $out[ESP]
]+64, \text{sout}[\text{ESP}]+96, \{-5\}, \{\text{EAX ECX ESP EFLAGS}\} [Handler: \text{$L1}]
#89
                                                                            #109
                  jmp $L27
                                                                            #109
$L27: (1 ref)
                                                                            #89
   ESP, EFLAGS = add ESP, 16(0\times00000010)
                                                                            #109
                  jmp $L23
                                                                            #109
$L23: (1 ref)
                                                                            #90
   t131(EFLAGS) = cmp(EQ) q[EBP], 1
                  jcc(EQ) t131(EFLAGS), $L17, $L16
                                                                            #90
                                                                            #90
$L17: (1 ref)
                                                                             #91
   _i[EBP]
                = mov 1
                                                                             #92
                  jmp $L18
                                                                             #92
$L18: (2 refs)
                                                                            #92
   t132(EFLAGS) = cmp(LE) i[EBP], 8
                                                                            #92
                  jcc(LE) t132(EFLAGS), $L20, $L19
                                                                            #92
$L20: (1 ref)
                                                                            #93
   tv133-(EAX) = mov 1
   tv133-(EAX)<*27>, EFLAGS = add tv133-(EAX), _i[EBP]
                                                                            #93
```

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```
#93
  i[EBP]
               = mov tv133-(EAX)
                                                                            #93
                 jmp $L18
                                                                            #92
$L19:
      (1 ref)
                                                                            #95
                 jmp $L21
                                                                            #90
$L16: (1 ref)
                                                                           #97
   [ESP], \{ESP\} = push &$SG1197, \{ESP\}
   {-5}, {EAX ECX EDX ESP EFLAGS MMO-MM7 XMMO-XMM7 FPO-FP7 FPUStatus} = call
 printf, $out[ESP], {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7
FPUStatus [Handler: $L1]
    #97
                                                                            #109
                 jmp $L28
                                                                            #109
$L28: (1 ref)
                                                                            #97
   ESP, EFLAGS = add ESP, 4
                                                                            #109
                 jmp $L24
                                                                            #109
$L24: (1 ref)
                                                                            #98
   [ESP], \{ESP\} = push 0, \{ESP\}
   {-5}, {EAX ECX EDX ESP EFLAGS MMO-MM7 XMMO-XMM7 FPO-FP7 FPUStatus} = call
  exit, $out[ESP], {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7 F
PUStatus [Handler: $L1]
    #98
                                                                            #109
                  jmp $L29
                                                                            #109
$L29: (1 ref)
                                                                            #98
   ESP, EFLAGS = add ESP, 4
                                                                            #109
                  jmp $L25
                                                                            #109
       (1 ref)
$L25:
                                                                            #95
                  jmp $L21
                                                                            #95
$L21:
       (2 refs)
                                                                            #100
                  jmp $L3
                                                                            #78
$L4: (1 ref)
   [ESP], \{ESP\} = push &$SG1198, \{ESP\}
                                                                            #101
   {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7 FPUStatus} = call
  printf, $out[ESP], {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7
 FPUStatus [Handler: $L1]
    #101
                                                                            #109
                  jmp $L30
                                                                            #109
$L30: (1 ref)
                                                                            #101
   ESP, EFLAGS = add ESP, 4
                                                                            #109
                  jmp $L26
                                                                            #109
$L26: (1 ref)
                                                                            #108
   t142 (EAX)
               = mov 0
                                                                            #108
                  jmp $L22
                                                                            #68
$L1: (4 refs)
                                                                            #68
                  UNWIND _main
                                                                            #108
$L22:
       (1 ref)
                                                                            #109
                  EPILOGSTART
                                                                            #109
   ESP
                = mov EBP
                                                                            #109
               = pop [ESP], {ESP}
   EBP, {ESP}
                                                                            #109
   {ESP}
                = ret {ESP}
                                                                            #109
                  EXITFUNC _main, t142(EAX)
                                                                            #109
                  END main, \{-7\}
```

```
#68
               = START main
   \{-7\}
                                                                            #68
                 ENTERFUNC main
                                                                            #68
   [ESP], \{ESP\} = push EBP, \{ESP\}
                                                                            #68
               = mov ESP
                                                                            #68
   ESP, EFLAGS = sub ESP, 16(0x00000010)
                                                                            #68
                 PROLOGEND
                                                                            #78
   doitagain[EBP] = mov 1
                                                                            #78
                 jmp $L2
                                                                            #78
$L2: (2 refs)
   t111(EFLAGS) = cmp(LE) doitagain[EBP], 6000(0x00001770)
                                                                            #78
                                                                            #78
                 jcc(LE) t\overline{1}11(EFLAGS), $L5
                                                                            #78
                 jmp $L4
                                                                            #78
$L5: (1 ref)
               = mov 0
                                                                            #80
   _{
m i[EBP]}
                                                                            #81
                 imp $L6
                                                                            #81
$L6: (2 refs)
   t112(EFLAGS) = cmp(LE) i[EBP], 16(0x00000010)
                                                                            #81
                                                                            #81
                 jcc(LE) t112(EFLAGS), $L8
                                                                            #81
                 jmp $L7
                                                                            #81
$L8: (1 ref)
                                                                            #83
   t113(EFLAGS) = cmp(GE) i[EBP], 1
                                                                            #83
                 jcc(GE) t113(EFLAGS), $L10
                                                                            #83
                 jmp $L9
                                                                            #83
$L10: (1 ref)
                                                                            #83
   t114(EFLAGS) = cmp(LE) i[EBP], 8
                                                                            #83
                 jcc(LE) tll4(EFLAGS), $L11
                                                                            #83
                  jmp $L9
                                                                            #83
$L11: (1 ref)
                                                                            #83
   t116(EAX), EFLAGS = imul i[EBP], 4
                                                                            #83
   tv117-(EAX) = mov t116(EAX)
   tv117-(EAX)<*17>, EFLAGS = add tv117-(EAX), &_a
                                                                            #83
                                                                            #83
   [tv117-(EAX)] = mov 1
                 jmp $L9
                                                                            #83
                                                                            #83
$L9: (3 refs)
                                                                            #84
   t119(EFLAGS) = cmp(GE) i[EBP], 2
                                                                            #84
                  jcc(GE) t\overline{1}19(EFLAGS), $L13
                                                                            #84
                  jmp $L12
                                                                            #84
$L13: (1 ref)
                                                                            #84
   t121(EAX), EFLAGS = imul i[EBP], 4
                                                                            #84
   tv122-(EAX) = mov t121(EAX)
   tv122-(EAX)<*20>, EFLAGS = add tv122-(EAX), & b
                                                                            #84
                                                                            #84
   [tv122-(EAX)] = mov 1
                                                                            #84
                  jmp $L12
                                                                            #84
$L12: (2 refs)
   t124(EFLAGS) = cmp(LE) i[EBP], 14(0x0000000e).
                                                                            #85
                                                                            #85
                  jcc(LE) t124(EFLAGS), $L15
                                                                            #85
                  jmp $L14
                                                                            #85
$L15: (1 ref)
                                                                            #85
   t126(EAX), EFLAGS = imul i[EBP], 4
   tv127-(EAX) = mov t126(EA\overline{X})
                                                                            #85
   tv127-(EAX)<*23>, EFLAGS = add tv127-(EAX), &_c
                                                                            #85
                                                                            #85
   [tv127-(EAX)] = mov 1
```

```
#85
                  jmp $L14
                                                                             #85
$L14: (2 refs)
                                                                             #86
   tv129-(EAX) = mov 1
                                                                             #86
   tv129-(EAX)<*24>, EFLAGS = add tv129-(EAX), i[EBP]
                                                                             #86
             = mov tv129-(EAX)
                                                                             #87
                  jmp $L6
                                                                             #81
$L7: (1 ref)
                                                                             #89
   [ESP], \{ESP\} = push \&_a, \{ESP\}
                                                                             #89
   [ESP], \{ESP\} = push & b, \{ESP\}
                                                                             #89
              = lea & q[EBP]
   t140(EAX)
                                                                             #89 -
   [ESP], \{ESP\} = push t140(EAX), \{ESP\}
                                                                             #89
   [ESP], \{ESP\} = push 1, \{ESP\}
   {-5}, {EAX ECX ESP EFLAGS} = call try, $out[ESP], $out[ESP]+32, $out[ESP]
]+64, \text{Sout}[\text{ESP}]+96, \{-5\}, \{\text{EAX ECX ESP EFLAGS}\} [Handler: $L1]
#89
                                                                             #109
                  jmp $L27
                                                                             #109
$L27: (1 ref)
                                                                             #89
   ESP, EFLAGS = add ESP, 16(0x00000010)
                                                                             #109
                  jmp $L23
                                                                             #109
$L23: (1 ref)
                                                                             #90
   t131(EFLAGS) = cmp(EQ) q[EBP], 1
                                                                             #90
                  jcc(EQ) t131(EFLAGS), $L17
                                                                             #90
                  jmp $L16
                                                                             #90
$L17: (1 ref)
                                                                             #91
   _i[EBP]
                = mov 1
                                                                             #92
                  jmp $L18
                                                                             #92
$L18: (2 refs)
                                                                             #92
   t132(EFLAGS) = cmp(LE) i[EBP], 8
                                                                             #92
                  jcc(LE) t132(EFLAGS), $L20
                                                                             #92
                  jmp $L19
                                                                             #92
$L20:
       (1 ref)
                                                                             #93
   tv133-(EAX) = mov 1
   tv133-(EAX)<*27>, EFLAGS = add tv133-(EAX), _i[EBP]
                                                                             #93
                                                                             #93
                = mov tv133-(EAX)
   i[EBP]
                                                                             #93
                  jmp $L18
                                                                             #92
$L19:
       (1 ref)
                                                                             #95
                  jmp $L21
                                                                             #90
       (1 ref)
$L16:
                                                                             #97
   [ESP], \{ESP\} = push &$SG1197, \{ESP\}
   {-5}, {EAX ECX EDX ESP EFLAGS MMO-MM7 XMMO-XMM7 FPO-FP7 FPUStatus} = call
  printf, $out[ESP], {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7
 FPUStatus [Handler: $L1]
    #97
                                                                             #109
                  jmp $L28
                                                                             #109
$L28: (1 ref)
                                                                             #97
   ESP, EFLAGS = add ESP, 4
                                                                             #109
                  jmp $L24
                                                                             #109
$L24: (1 ref)
                                                                             #98
   [ESP], \{ESP\} = push 0, \{ESP\}
   {-5}, {EAX ECX EDX ESP EFLAGS MMO-MM7 XMMO-XMM7 FPO-FP7 FPUStatus} = call
  exit, $out[ESP], {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7 F
PUStatus [Handler: $L1]
    #98
```

```
#109
                 jmp $L29
                                                                           #109
$L29: (1 ref)
                                                                           #98
   ESP, EFLAGS = add ESP, 4
                                                                           #109
                 jmp $L25
                                                                           #109
$L25:
     (1 ref)
                                                                           #95
                 jmp $L21
                                                                           #95
$L21: (2 refs)
                                                                           #100
                 jmp $L3
                                                                           #78
$L3: (1 ref)
                                                                           #78
             = mov doitagain[EBP]
  t109(EAX)
                                                                           #78
   tv110-(EAX) = mov t109(EAX)
                                                                           #78
   tv110-(EAX)<*5>, EFLAGS = add tv110-(EAX), 1
                                                                           #78
   doitagain[EBP] = mov tv110-(EAX)
                                                                           #78
                 jmp $L2
                                                                           #78
$L4: (1 ref)
                                                                           #101
   [ESP], \{ESP\} = push &$SG1198, \{ESP\}
   {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7 FPUStatus} = call
 printf, $out[ESP], {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7
 FPUStatus [Handler: $L1]
    #101
                                                                           #109
                 jmp $L30
                                                                           #109
$L30: (1 ref)
                                                                           #101
   ESP, EFLAGS = add ESP, 4
                                                                           #109
                  jmp $L26
                                                                           #109
$L26: (1 ref)
               = mov 0
                                                                           #108
   t142(EAX)
                                                                           #108
                  jmp $L22
                                                                           #108
$L22: (1 ref)
                                                                            #109
                 EPILOGSTART
                                                                           #109
   ESP
               = mov EBP
                                                                            #109
               = pop [ESP], {ESP}
   EBP, {ESP}
                                                                            #109
               = ret {ESP}
   {ESP}
                                                                            #109
                  EXITFUNC main, t142(EAX)
                                                                            #68
$L1: (4 refs)
                                                                            #68
                  UNWIND main
                                                                            #109
                  END main, \{-7\}
IR after Flow Optimization (flag FlowOpts)
                                                                            #68
               = START main
   \{-7\}
                                                                            #68
                 ENTERFUNC _main
                                                                            #68
   [ESP], \{ESP\} = push EBP, \{ESP\}
                                                                            #68
               = mov ESP
   EBP
                                                                            #68
   ESP, EFLAGS = sub ESP, 16(0\times00000010)
                                                                            #68
                  PROLOGEND
                                                                            #78
    doitagain[EBP] = mov 1
                                                                            #78
$L2: (1 ref)
   t111(EFLAGS) = cmp(LE) doitagain[EBP], 6000(0x00001770)
                                                                            #78
                                                                            #78
                  jcc(GT) t111(EFLAGS), $L4
                                                                            #80
    i[EBP]
               = mov 0
                                                                            #81
$L6: (1 ref)
   t112(EFLAGS) = cmp(LE) i[EBP], 16(0x00000010)
                                                                            #81
                                    Page 56
```

```
AppendixF.txt
                                                                            #81
                 jcc(GT) t112(EFLAGS), $L7
                                                                            #83
  t113(EFLAGS) = cmp(GE) i[EBP], 1
                                                                            #83
                 jcc(LT) t\overline{1}13(EFLAGS), $L9
                                                                            #83
   t114(EFLAGS) = cmp(LE) i[EBP], 8
                                                                            #83
                 jcc(GT) t114(EFLAGS), $L9
                                                                            #83
   t116(EAX), EFLAGS = imul i[EBP], 4
                                                                            #83
   tv117-(EAX) = mov t116(EAX)
   tv117-(EAX)<*17>, EFLAGS = add tv117-(EAX), & a
                                                                            #83
                                                                            #83
   [tv117-(EAX)] = mov 1
                                                                            #83
$L9: (2 refs)
                                                                            #84
  t119(EFLAGS) = cmp(GE) i[EBP], 2
                 jcc(LT) t119(EFLAGS), $L12
                                                                            #84
                                                                            #84
   t121(EAX), EFLAGS = imul i[EBP], 4
                                                                            #84
   tv122-(EAX) = mov t121(EAX)
                                                                            #84
   tv122-(EAX)<*20>, EFLAGS = add tv122-(EAX), & b
                                                                            #84
   [tv122-(EAX)] = mov 1
                                                                            #84
$L12: (1 ref)
                                                                            #85
   t124(EFLAGS) = cmp(LE) _i[EBP], 14(0x0000000e)
                                                                            #85
                 jcc(GT) t124(EFLAGS), $L14
                                                                            #85
   t126(EAX), EFLAGS = imul i[EBP], 4
                                                                            #85
   tv127-(EAX) = mov t126(EAX)
                                                                            #85
   tv127-(EAX)<*23>, EFLAGS = add tv127-(EAX), & c
                                                                            #85
   [tv127-(EAX)] = mov 1
                                                                            #85
$L14: (1 ref)
                                                                            #86
   tv129-(EAX) = mov 1
                                                                            #86
   tv129-(EAX)<*24>, EFLAGS = add tv129-(EAX), _i[EBP]
                                                                            #86
   i[EBP]
               = mov tv129-(EAX)
                                                                             #87
                  jmp $L6
                                                                             #81
$L7: (1 ref)
                                                                             #89
   [ESP], \{ESP\} = push &_a, \{ESP\}
                                                                             #89
   [ESP], \{ESP\} = push & b, \{ESP\}
                                                                             #89
   t140(EAX) = lea &_q[EBP]
                                                                             #89
   [ESP], \{ESP\} = push t140(EAX), \{ESP\}
                                                                             #89
   [ESP], \{ESP\} = push 1, \{ESP\}
   {-5}, {EAX ECX ESP EFLAGS} = call try, $out[ESP], $out[ESP]+32, $out[ESP]
]+64, \text{sout}[\text{ESP}]+96, \{-5\}, \{\text{EAX ECX ESP EFLAGS}\} [Handler: $L1]
#89
                                                                             #89
   ESP, EFLAGS = add ESP, 16(0\times00000010)
                                                                             #90
   t131(EFLAGS) = cmp(EQ) q[EBP], 1
                                                                             #90
                  jcc(NE) t\overline{131}(EFLAGS), $L16
                                                                             #91
    i[EBP]
               = mov 1
                                                                             #92
$L18: (1 ref)
   t132(EFLAGS) = cmp(LE) i[EBP], 8
                                                                             #92
                                                                             #92
                  jcc(GT) t132(EFLAGS), $L3
                                                                             #93
   tv133-(EAX) = mov 1
                                                                             #93
   tv133-(EAX)<*27>, EFLAGS = add tv133-(EAX), i[EBP]
                                                                             #93
   _i[EBP]
               = mov tv133-(EAX)
                                                                             #93
                  jmp $L18
                                                                             #90
$L16: (1 ref)
                                                                             #97
   [ESP], \{ESP\} = push &$SG1197, \{ESP\}
   {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7 FPUStatus} = call
  printf, Sout[ESP], {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7
 FPUStatus [Handler: $L1]
```

```
#97
                                                                           #97
  ESP, EFLAGS = add ESP, 4
                                                                           #98
   [ESP], \{ESP\} = push 0, \{ESP\}
  {-5}, {EAX ECX EDX ESP EFLAGS MMO-MM7 XMMO-XMM7 FPO-FP7 FPUStatus} = call
 exit, $out[ESP], {-5}, {EAX ECX EDX ESP EFLAGS MMO-MM7 XMMO-XMM7 FPO-FP7 F
PUStatus [Handler: $L1]
                                                                           #98
   ESP, EFLAGS = add ESP, 4
                                                                           #78
$L3: (1 ref)
                                                                           #78
   t109(EAX)
               = mov doitagain[EBP]
                                                                           #78
   tv110-(EAX) = mov \overline{t}109(EAX)
                                                                           #78
   tv110-(EAX)<*5>, EFLAGS = add tv110-(EAX), 1
                                                                           #78
   doitagain[EBP] = mov tv110-(EAX)
                                                                           #78
                 jmp $L2
                                                                           #78
$L4: (1 ref)
                                                                           #101
   [ESP], \{ESP\} = push &$SG1198, \{ESP\}
   {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7 FPUStatus} = call
 printf, $out[ESP], {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7
FPUStatus | [Handler: $L1]
    #101
                                                                            #101
   ESP, EFLAGS = add ESP, 4
                                                                            #108
               = mov 0
   t142(EAX)
                                                                            #109
                 EPILOGSTART
                                                                            #109
               = mov EBP
                                                                            #109
               = pop [ESP], {ESP}
   EBP, {ESP}
                                                                            #109
               = ret {ESP}
   {ESP}
                                                                            #109
                 EXITFUNC main, t142(EAX)
                                                                            #68
$L1: (4 refs)
                                                                            #68
                 UNWIND main
                                                                            #109
                 END main, \{-7\}
IR after Encoding, Listing, COFF Emission (flag Encode)
                                                                            #68
               = START main
   \{-7\}
                                                                            #68
                 ENTERFUNC _main
                                                                            #68
   [ESP], {ESP} = push EBP, {ESP}
                                                                            #68
               = mov ESP
                                                                            #68
   ESP, EFLAGS = sub ESP, 16(0x0000010)
                                                                            #68
                 PROLOGEND
                                                                            #78
    doitagain[EBP] = mov 1
                                                                            #78
$L2: (1 ref)
   t111(EFLAGS) = cmp(LE) doitagain[EBP], 6000(0x00001770)
                                                                            #78
                                                                            #78
                  jg(GT) t111(EFLAGS), $L4
                                                                            #80
    i[EBP]
               = mov 0
                                                                            #81
$L6: (1 ref)
                                                                            #81
   t112(EFLAGS) = cmp(LE) i[EBP], 16(0x00000010)
                                                                            #81
                  jg(GT) t1\overline{12}(EFLAGS), $L7
                                                                            #83
   t113(EFLAGS) = cmp(GE) i[EBP], 1
                                                                            #83
                 jl(LT) t1\overline{1}3(EFLAGS), $L9
                                                                            #83
   t114(EFLAGS) = cmp(LE) i[EBP], 8
                                                                            #83
                  jg(GT) t114(EFLAGS), $L9
                                                                            #83
   tv116-(EAX)<*16>, EFLAGS = imul i[EBP], 4
                                     Page 58
```

```
AppendixF.txt
                                                                             #83
   tv117-(EAX)<*17>, EFLAGS = add tv117-(EAX), & a
                                                                             #83
   [tv117-(EAX)] = mov 1
$L9: (2 refs)
                                                                            #83
                                                                            #84
   t119(EFLAGS) = cmp(GE) i[EBP], 2
                                                                             #84
                  jl(LT) t119(EFLAGS), $L12
                                                                             #84
   tv121-(EAX)<*19>, EFLAGS = imul i[EBP], 4
   tv122-(EAX)<*20>, EFLAGS = add tv122-(EAX), & b
                                                                            #84
                                                                             #84
   [tv122-(EAX)] = mov 1
                                                                             #84
$L12: (1 ref)
   t124(EFLAGS) = cmp(LE) i[EBP], 14(0x0000000e)
                                                                            #85
                                                                            #85
                  jg(GT) t124(EFLAGS), $L14
                                                                            #85
   tv126-(EAX)<*22>, EFLAGS = imul i[EBP], 4
                                                                             #85
   tv127-(EAX)<*23>, EFLAGS = add tv127-(EAX), & c
   [tv127-(EAX)] = mov 1
                                                                             #85
                                                                             #85
$L14: (1 ref)
                                                                             #86
   tv129-(EAX) = mov 1
   tv129-(EAX)<*24>, EFLAGS = add tv129-(EAX), i[EBP]
                                                                             #86
   i[EBP]
                                                                             #86
               = mov tv129-(EAX)
                  jmp $L6
                                                                             #87
                                                                             #81
$L7: (1 ref)
   [ESP], \{ESP\} = push & a, \{ESP\}
                                                                             #89
                                                                             #89
   [ESP], \{ESP\} = push & b, \{ESP\}
   t140(EAX) = lea \& q[EBP]
                                                                             #89
   [ESP], \{ESP\} = push t140(EAX), \{ESP\}
                                                                             #89
   [ESP], \{ESP\} = push 1, \{ESP\}
                                                                             #89
   {-5}, {EAX ECX ESP EFLAGS} = call try, $out[ESP], $out[ESP]+32, $out[ESP]
]+64, \{\text{Sout}[\text{ESP}]+96, \{-5\}, \{\text{EAX ECX ESP EFLAGS}\} [\text{Handler: $L1}]
#89
                                                                             #89
   ESP, EFLAGS = add ESP, 16(0\times00000010)
                                                                             #90
   t131(EFLAGS) = cmp(EQ) q[EBP], 1
                                                                             #90
                  jne(NE) t\bar{1}31(EFLAGS), $L16
    i[EBP]
                                                                             #91
               = mov 1
                                                                             #92
$L18: (1 ref)
                                                                             #92
   t132(EFLAGS) = cmp(LE) i[EBP], 8
                  jg(GT) t1\overline{3}2(EFLAGS), $L3
                                                                             #92
                                                                             #93
   tv133-(EAX) = mov 1
   tv133-(EAX)<*27>, EFLAGS = add tv133-(EAX), i[EBP]
                                                                             #93
                                                                             #93
   i[EBP]
               = mov tv133-(EAX)
                                                                             #93
                  jmp $L18
                                                                             #90
$L16: (1 ref)
   [ESP], \{ESP\} = push &$SG1197, \{ESP\}
                                                                             #97
   {-5}, {EAX ECX EDX ESP EFLAGS MMO-MM7 XMMO-XMM7 FPO-FP7 FPUStatus} = call
  printf, $out[ESP], {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7
 FPUStatus [Handler: $L1]
                                                                             #97
   ESP, EFLAGS = add ESP, 4
                                                                             #98
   [ESP], \{ESP\} = push 0, \{ESP\}
   {-5}, {EAX ECX EDX ESP EFLAGS MMO-MM7 XMMO-XMM7 FPO-FP7 FPUStatus} = call
  exit, $out[ESP], {-5}, {EAX ECX EDX ESP EFLAGS MMO-MM7 XMMO-XMM7 FPO-FP7 F
PUStatus [Handler: $L1]
    #98
   ESP, EFLAGS = add ESP, 4
                                                                             #98
                                                                             #78
$L3: (1 ref)
```

```
AppendixF.txt
   tv109-(EAX)<*4> = mov doitagain[EBP]
                                                                            #78
   tv110-(EAX)<*5>, EFLAGS = add tv110-(EAX), 1
                                                                            #78
                                                                            #78
   doitagain[EBP] = mov tv110-(EAX)
                                                                            #78
                 jmp $L2
                                                                            #78
$L4: (1 ref)
   [ESP], \{ESP\} = push &$SG1198, \{ESP\}
                                                                            #101
   {-5}, {EAX ECX EDX ESP EFLAGS MMO-MM7 XMMO-XMM7 FPO-FP7 FPUStatus} = call
 printf, $out[ESP], {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7
FPUStatus | [Handler: $L1]
    #101
                                                                            #101
   ESP, EFLAGS = add ESP, 4
                                                                            #108
   t142 (EAX)
              = mov 0
                                                                            #109
                 EPILOGSTART
                                                                            #109
   ESP
               = mov EBP
                                                                            #109
   EBP, \{ESP\} = pop [ESP], \{ESP\}
                                                                            #109
               = ret {ESP}
   {ESP}
                                                                            #109
                 EXITFUNC main, t142(EAX)
                                                                            #68
$L1: (4 refs)
                 UNWIND main
                                                                            #68
                 END main, \{-7\}
                                                                            #109
IR after LIR Phases (flag LIR Phases) [SubPhaseList]
                                                                            #68
               = START main
   \{-7\}
                                                                            #68
                 ENTERFUNC main
                                                                            #68
   [ESP], \{ESP\} = push EBP, \{ESP\}
                                                                            #68
               = mov ESP
   EBP
                                                                            #68
   ESP, EFLAGS = sub ESP, 16(0\times00000010)
                                                                            #68
                 PROLOGEND
   doitagain[EBP] = mov 1
                                                                            #78
                                                                            #78
$L2: (1 ref)
   t111(EFLAGS) = cmp(LE) doitagain[EBP], 6000(0x00001770)
                                                                            #78
                 jg(GT) t1\overline{1}1(EFLAGS), $L4
                                                                            #78
                                                                            #80
               = mov 0
    i[EBP]
$L6: (1 ref)
                                                                            #81
   t112(EFLAGS) = cmp(LE) i[EBP], 16(0x00000010)
                                                                            #81
                 jg(GT) t1\overline{12}(EFLAGS), $L7
                                                                            #81
   t113(EFLAGS) = cmp(GE) i[EBP], 1
                                                                            #83
                                                                            #83
                 jl(LT) t113(EFLAGS), $L9
                                                                            #83
   t114(EFLAGS) = cmp(LE) i[EBP], 8
                                                                            #83
                 jg(GT) t1\overline{14}(EFLAGS), $L9
   tv116-(EAX)<*16>, EFLAGS = imul i[EBP], 4
                                                                            #83
   tv117-(EAX)<*17>, EFLAGS = add tv117-(EAX), & a
                                                                            #83
                                                                            #83
   [tv117-(EAX)] = mov 1
                                                                            #83
$L9: (2 refs)
                                                                            #84
   t119(EFLAGS) = cmp(GE) i[EBP], 2
                  jl(LT) t1\overline{19}(EFLAGS), $L12
                                                                            #84
                                                                            #84
   tv121-(EAX)<*19>, EFLAGS = imul i[EBP], 4
   tv122-(EAX)<*20>, EFLAGS = add tv122-(EAX), & b
                                                                            #84
   [tv122-(EAX)] = mov 1
                                                                            #84
                                                                            #84
$L12: (1 ref)
   t124(EFLAGS) = cmp(LE) i[EBP], 14(0x0000000e)
                                                                            #85
```

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```
AppendixF.txt
                                                                            #85
                 jg(GT) t124(EFLAGS), $L14
                                                                            #85
  tv126-(EAX)<*22>, EFLAGS = imul i[EBP], 4
   tv127-(EAX)<*23>, EFLAGS = add tv127-(EAX), &_c
                                                                            #85
                                                                            #85
   [tv127-(EAX)] = mov 1
                                                                            #85
$L14: (1 ref)
                                                                            #86
   tv129-(EAX) = mov 1
                                                                            #86
   tv129-(EAX)<*24>, EFLAGS = add tv129-(EAX), i[EBP]
                                                                            #86
               = mov tv129-(EAX)
                                                                            #87
                 jmp $L6
                                                                            #81
$L7: (1 ref)
                                                                            #89
   [ESP], \{ESP\} = push &_a, \{ESP\}
                                                                            #89
   [ESP], \{ESP\} = push \& b, \{ESP\}
                                                                            #89
   t140(EAX)
             = lea & q[EBP]
   [ESP], \{ESP\} = push t140(EAX), \{ESP\}
                                                                            #89
   [ESP], \{ESP\} = push 1, \{ESP\}
                                                                            #89
   {-5}, {EAX ECX ESP EFLAGS} = call try, $out[ESP], $out[ESP]+32, $out[ESP]
]+64, \text{sout}[\text{ESP}]+96, \{-5\}, \{\text{EAX ECX ESP} \text{ EFLAGS}\} [Handler: $L1]
#89
   ESP, EFLAGS = add ESP, 16(0x00000010)
                                                                            #89
                                                                            #90
   t131(EFLAGS) = cmp(EQ) q[EBP], 1
                                                                            #90
                 jne(NE) t131(EFLAGS), $L16
                                                                            #91
    i[EBP]
               = mov 1
                                                                            #92
$L18: (1 ref)
   t132(EFLAGS) = cmp(LE) i[EBP], 8
                                                                            #92
                 jg(GT) t132(EFLAGS), $L3
                                                                            #92
                                                                            #93
   tv133-(EAX) = mov 1
   tv133-(EAX)<*27>, EFLAGS = add tv133-(EAX), i[EBP]
                                                                            #93
                                                                            #93
               = mov tv133-(EAX)
                                                                            #93
                  jmp $L18
                                                                            #90
$L16: (1 ref)
   [ESP], \{ESP\} = push &$SG1197, \{ESP\}
   {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7 FPUStatus} = call
  printf, $out[ESP], {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7
 FPUStatus [Handler: $L1]
    #97
                                                                            #97
   ESP, EFLAGS = add ESP, 4
                                                                            #98
   [ESP], \{ESP\} = push 0, \{ESP\}
   {-5}, {EAX ECX EDX ESP EFLAGS MMO-MM7 XMMO-XMM7 FPO-FP7 FPUStatus} = call
  exit, $out[ESP], {-5}, {EAX ECX EDX ESP EFLAGS MMO-MM7 XMMO-XMM7 FPO-FP7 F
PUStatus [Handler: $L1]
    #98
                                                                            #98
   ESP, EFLAGS = add ESP, 4
                                                                            #78
$L3: (1 ref)
                                                                            #78
   tv109-(EAX)<*4> = mov doitagain[EBP]
                                                                            #78
   tv110-(EAX)<*5>, EFLAGS = add tv110-(EAX), 1
                                                                            #78
   doitagain[EBP] = mov tv110-(EAX)
                                                                            #78
                  jmp $L2
                                                                            #78
$L4: (1 ref)
   [ESP], \{ESP\} = push &$SG1198, \{ESP\}
                                                                            #101
   {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7 FPUStatus} = call
  printf, $out[ESP], {-5}, {EAX ECX EDX ESP EFLAGS MM0-MM7 XMM0-XMM7 FP0-FP7
 FPUStatus [Handler: $L1]
    #101
```

ESP, EFLAGS	= add ESP, 4	#101
t142 (EAX)	= mov 0	#108
	EPILOGSTART	#109
ESP	= mov EBP	#109
EBP, {ESP}	= pop [ESP], {ESP}	#109
{ESP}	= ret {ESP}	#109
,	EXITFUNC main, t142(EAX)	#109
\$L1: (4 refs)	- · · · · · · · · · · · · · · · · · · ·	#68
, ,	UNWIND main	#68
	END main, $\{-7\}$	#109

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